

FOREWORD

This manual covers the service procedures of the TOYOTA FORKLIFT 5FGC70~15 Series. Please use this manual for providing quick, correct servicing of the corresponding forklift models.

*This manual deals with the above models as of September 7988. Please understand that disagreement can take place between the descriptions in the manual and actual vehicles due to change in design and specifications. Any change or modifications thereafter will be informed by Toyota **Industrial** Vehicles' Parts & Service News.*

For the service procedures of the mounted engine, read the repair manuals listed below as reference together with this manual.

(Reference)

Repair manuals related to this manual are as follows:

*TOYOTA INDUSTRIAL VEHICLE 4Y ENGINE
REPAIR MANUAL (No. CE602)*

*TOYOTA INDUSTRIAL VEHICLE 4P ENGINE
REPAIR MANUAL (No. CE604)*

TOYOTA MOTOR CORPORATION

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GENERAL

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EXTERIOR VIEWS



Front View

LAR32-36



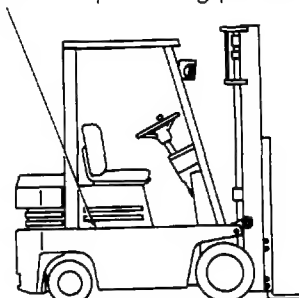
Rear View

LAR32-38

VEHICLE LISTING

Payload	Model	Engine model	Engine type	Drive system	Remarks
1.0 ton	5FGC10	4Y	Gasoline	Torque converter	P/S installed as standard
	30-5FGC10	4P	↑	↑	↑
1.25 ton	5FGC13	4Y	↑	↑	↑
	30-5FGC13	4P	↑	↑	↑
1.5 ton	5FGC15	4Y	↑	↑	↑
	30-5FGC15	4P	↑	↑	↑

FRAME NUMBER

Engine	Vehicle model	Punching	Punching position
4Y	5FGC10	5FGC15-10011	Frame No. punching position 
	5FGC13		
	5FGC15		
4P	30-5FGC10	305FGC15-10011	
	30-5FGC13		
	30-5FGC15		

ABBREVIATIONS

Abbreviations used in this manual are as follows:

Abbreviation (Code)	Meaning	Abbreviation (Code)	Meaning
ABDC	After Bottom Dead Center	P/S	Power Steering
ASSY	Assembly	RH	Right Hand
ATDC	After Top Dead Center	SAE	Society of Automotive Engineers (USA)
ATM	Automatic Transmission	SST	Special Service Tool
BBDC	Before Bottom Dead Center	STD	Standard
LH	Left Hand	SUB-ASSY	Sub-assembly
LLC	Long Life Coolant	T =	Tightening Torque
MTM	Manual Transmission	OOT	Number of Teeth (00)
OHV	Overhead valve	U/S	Undersize
OPT	Option	w/	With
O/S	Oversize		
PS	Horsepower		

OPERATIONAL TIPS

- Safe operation
 - Make sure that correct size wire is used for hoisting a heavy material.
 - After jacking up, always support with rigid racks or stands.
- Preparation of SSTs and measuring tools
 - Prepare SSTs and measuring tools before starting operation.
- Clearing and arrangement
 - Always keep the workshop neat and orderly for easy operation.
 - Disassembly of hydraulic equipment shall always be done in a clean place using clean tools.
- Genuine Toyota parts

Genuine Toyota parts should be used even in the replacement of packings, gaskets and O-rings.
- Repairs on electrical system

Before doing any repairs on the electrical system, disconnect the cables from the battery terminals. Be sure to disconnect the negative (–) cable first.
- Tightening torque for installation

Be sure to observe the tightening torque given in this manual. If not specified, tighten to the torque listed in standard bolt & nut tightening torque.
- Defect status grasp

Do not start disassembly and replacement as soon as a defect is found, but first grasp whether the defect requires disassembly and replacement. In the case of torque converter for example, do not attempt torque converter disassembly upon a failure in starting the vehicle, but first check such factors as the oil, pressure and rotation status causing the failure.

STANDARD BOLT & NUT TIGHTENING TORQUE






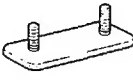

Standard bolt and nut tightening torques are not indicated.

Judge the standard tightening torque as shown below.

1. Find out the straight type of bolt from the list below and then find the bolt tightening torque from the table.
2. The nut tightening torque can be judged from the mating bolt type.

BOLT STRENGTH TYPE IDENTIFICATION METHOD

1. Identification by bolt shape

	Shape and identification method		Strength type
Standard hexagon bolt		Number in relief or hallmark on the head	4 = 4T 5 = 5T 6 = 6T 7 = 7T
		No mark	4T
Flanged hexagon bolt		No mark	4T
Standard hexagon bolt		Standard bolt with two relief lines on the head	5T
Flanged hexagon bolt		Standard bolt with two relief lines on the head	6T
Standard hexagon bolt		Standard bolt with three relief lines on the head	7T
Weld bolt			4T
Stud bolt		No mark	6T
		Approximately 2 mm (0.08 in.) hollow on either both ends	

2. Identification by part No.

Hexagon bolt

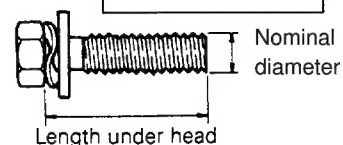
Part No. example

9 1 1 1 1 — 4 0 6 1 0

Length under head (mm)

Nominal diameter (mm)

Strength type



Stud bolt

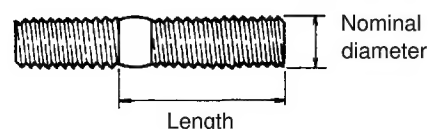
Part No. example

9 2 1 3 2 — 4 0 6 1 4

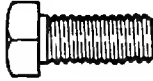
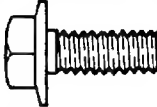
Length (mm)

Nominal diameter (mm)

Strength type



TIGHTENING TORQUE TABLE

Strength type	Nominal diameter mm	Pitch mm	Standard tightening torque kg-cm (ft-lb)	
			Standard 	Flanged 
4T	6	1.0	55 (4.0)	60 (4.3)
	8	1.25	130 (9.4)	145 (10.5)
	10	1.25	260 (18.8)	290 (20.9)
	12	1.25	480 (34.7)	540 (39.0)
	14	1.5	760 (54.9)	850 (61.4)
	16	1.5	1150 (83.0)	—
5T	6	1.0	65 (4.7)	—
	8	1.25	160 (11.6)	—
	10	1.25	330 (23.8)	—
	12	1.25	600 (43.3)	—
	14	1.5	930 (67.1)	—
	16	1.5	1400 (101.1)	—
6T	6	1.0	80 (5.8)	90 (6.5)
	8	1.25	195 (14.1)	210 (15.2)
	10	1.25	400 (28.9)	440 (31.8)
	12	1.25	730 (52.7)	810 (58.5)
	14	1.5	1100 (79.4)	1250 (90.3)
7T	6	1.0	110 (7.9)	120 (8.7)
	8	1.25	260 (18.8)	290 (20.9)
	10	1.25	530 (38.3)	590 (42.6)
	12	1.25	970 (70.0)	1050 (75.8)
	14	1.5	1500 (108.3)	1700 (122.7)
	16	1.5	2300 (166.1)	—

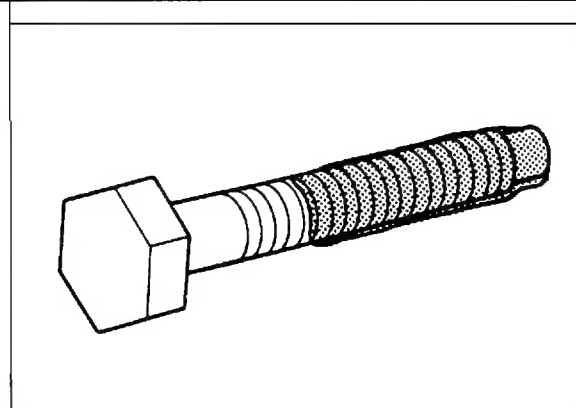
PRECOAT BOLTS

(Bolts with seal lock agent coating on threads)

1. Do not use the precoat bolt as it is in either of the following cases:
 - (a) After it is removed.
 - (b) When the precoat bolt is moved (loosened or tightened) by tightness check, etc.

Note:

For torque check, use the lower limit of the allowable tightening torque range. If the bolt moves, retighten it according to the steps below.



Precoat Bolts

B4460

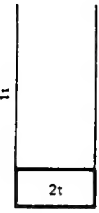
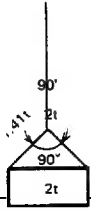
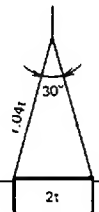
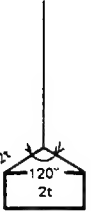
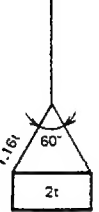
2. Method for reuse of precoat bolts
 - (1) Wash the bolt and threaded hole. (The threaded hole must be washed even for replacement of the bolt.)
 - (2) Perfectly dry the washed parts by air blowing.
 - (3) Coat the specified seal lock agent to the threaded portion of the bolt.

HIGH PRESSURE HOSE FITTING TIGHTENING TORQUE

1. When connecting a high pressure hose, wipe the hose fitting and mating nipple contact surfaces with clean cloth to remove foreign matters and dirt. Also check for no dent or other damage on the contact surfaces before installation.
2. When connecting a high pressure hose, hold the hose to align the fitting with the nipple and tighten the fitting.
3. The maximum tightening torque must not exceed twice the standard tightening torque.

Nominal diameter of screw	Standard tightening torque kg-m (ft-lb)		Hose inside diameter (mm)
	Standard	Tightening range	
7/16 — 20UNF	2.5 (18.1)	2.4— 2.6 (17.4— 18.8)	6
9/16 — 18UNF	5.0 (36.2)	4.8— 5.3 (34.7— 38.3)	9
3/4 — 16UNF	6.0 (43.4)	5.7— 6.3 (41.2— 45.5)	12
7/8 — 14UNF	6.0 (43.4)	5.7— 6.3 (41.2— 45.5)	12
1 1/16 — 12UNF	12.0 (86.8)	11.4—12.6 (82.4— 91.1)	19
1 5/16 — 12UNF	14.0 (101.2)	13.3—14.7 (96.2—106.3)	25
PF1/4	5.0 (36.2)	4.8— 5.3 (34.7— 38.3)	9
PF3/8	5.0 (36.2)	4.8— 5.3 (34.7— 38.3)	9
PF1/2	6.0 (43.4)	5.7— 6.3 (41.2— 45.5)	12
PF3/4	12.0 (86.8)	11.4—12.6 (82.4— 91.1)	19
PF1	14.0 (101.2)	13.3—14.7 (96.2—106.3)	25

WIRE ROPE SUSPENSION ANGLE LIST

Lifting angle	Tension	Compression	Suspension method	Lifting angle	Tension	Compression	Suspension method
0°	1.00 time	0 time		90°	1.41 time	1.00 time	
30°	1.04 time	0.27 time		120°	2.00 time	1.73 time	
60°	1.16 time	0.58 time					

SAFE LOAD FOR EACH WIRE ROPE SUSPENSION ANGLE

Unit: ton (lb)

Rope diameter	Cutting load	Single-rope suspension	Two-rope suspension				Four-rope suspension			
		0°	0°	30°	60°	90°	0°	30°	60°	90°
6 mm (0.24 in.)	2.18 (4807)	0.31 (683.6)	0.62 (1367)	0.6 (1323)	0.53 (1169)	0.44 (970)	1.24 (2734)	1.2 (2646)	1.06 (2337)	0.88 (1940)
8 mm (0.32 in.)	3.21 (7078)	0.45 (992.3)	0.9 (1985)	0.87 (1918)	0.78 (1720)	0.64 (1411)	1.8 (3969)	1.74 (3937)	1.56 (3440)	1.28 (2822)
10 mm (0.4 in.)	5.02 (11069)	0.71 (1565.6)	1.43 (3153)	1.37 (3021)	1.2 (2646)	1.0 (2205)	2.8 (6174)	2.7 (5954)	2.4 (5292)	2.0 (4410)
12.5 mm (0.5 in.)	7.84 (17387)	1.12 (2469.5)	2.2 (4851)	2.1 (4631)	1.9 (4190)	1.5 (3308)	4.4 (9702)	4.2 (9261)	3.8 (8379)	3.0 (6615)
14 mm (0.56 in.)	9.83 (21675)	1.4 (3087)	2.8 (6174)	2.7 (5954)	2.4 (5292)	1.9 (4190)	5.6 (12348)	5.4 (11907)	4.8 (10584)	3.8 (8379)

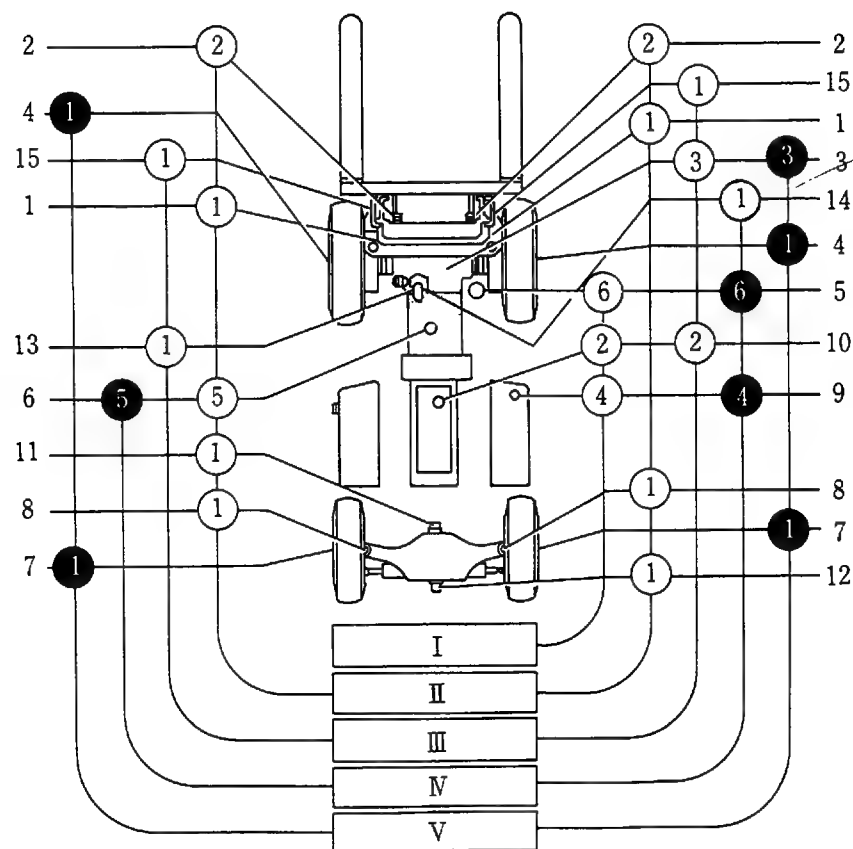
COMPONENTS WEIGHT

Engine	4Y engine: 134 kg (294.8 lbs) 4P engine: 128 kg (281.6 lbs)
Torque converter	Okamura torque converter: 120 kg (264 lbs)
Differential & front axle (w/brake)	210 kg (462 lbs)
Counterweight	1.0 ton: 495 kg (1100 lbs) 1.25 ton: 695 kg (1550 lbs) 1.50 ton: 895 kg (2000 lbs)
V Mast (max. fork height: 3000 mm)	W/Lift bracket: 414 kg (910 lbs) L/Lift bracket: 322 kg (708 lbs)

RECOMMENDED LUBRICANT QUANTITY & TYPES

Description	Classification	Type	Application	Capacity
Gasoline	API SD, SE, SF	Motor oil SAE30 (SAE20 in cold area) SAE20W-40 (SAE 10W-30 in cold area)	4P 4Y	4.3 ℓ (1.14 US gal) 4.0 ℓ (1.06 US gal)
Torque converter	ATF	GM Dexron® II	OKAMURA make	9.5 ℓ (2.51 US gal)
Differential	API GL-4 GL-5	Hypoid gear oil SAE85W-90		5.0 ℓ (1.32 US gal)
Hydraulic oil	ISO VG32	Hydraulic oil #90		All capacity 24 ℓ (6.34 US gal) Oil tank capacity 19 ℓ (5.0 US gal)
Brake	—	SAE J-1703 DOT-3		Proper quantity Reservoir Tank 0.2 ℓ (0.05 US gal)
Chassis parts		MP Grease	All models	Proper quantity
Coolant	LLC	●*LLC 30-50% mixture (for winter or all-season) @Coolant with rust-inhibitor (for spring, summer and autumn)	11.5 ℓ (3.04 US gal)	
Coolant (Reservoir Tank)	t	t	All models	0.6 ℓ (0.16 US gal)

LUBRICATION CHARTS



1. Mast support bushing
2. Chain
3. Differential
4. Front wheel bearing
5. Brake master cylinder
6. Torque converter mission
7. Rear wheel bearing
8. Steering knuckle king pin
9. Oil tank
10. Engine crank case
11. Rear axle beam front
12. Rear axle beam rear
13. Tilt steering universal joint
14. Tilt steering locking mechanism
15. Tilt cylinder front pin

- I Inspect every 8 hours (daily)
- II Inspect every 40 hours (weekly)
- III Inspect every 170 hours (monthly)
- IV Inspect every 1000 hours (6 monthly)
- V Inspect every 2000 hours (annually)
- Inspect and service
- Replace

1. MP grease
2. Engine oil
3. Hypoid gear oil
4. Hydraulic oil
5. Automatic transmission fluid
6. Brake fluid

Lubrication Chart

LARM81

PERIODIC MAINTENANCE

INSPECTION METHOD

I : Inspection. Repair or replacement if required.

M : Measurement. Repair or adjustment if required.

T : Retightening C : Cleaning L : Lubrication

* : For new vehicle *1 : Soapy water *2 : Detector *3 : Flaw detector

Item		Inspection Period	Months	1	3	6	12
			Hours	170	500	1000	2000
ENGINE							
Main body	Proper starting and abnormal noise	I	O	O	O	O	O
	Rotating condition at idling	M	O	O	O	O	O
	Rotating condition during acceleration	M	O	O	O	O	O
	Exhaust gas condition	I	O	O	O	O	O
	Air cleaner element	C	O	O	O	O	O
	Valve clearance	M	O*				O
	Compression	M					O
	Cylinder head bolt loosening	T	O*				O
	Muffler rubber mount	I					O
PCV system	Clogging and damage in PCV valve and piping	I	O	O	O	O	O
Governor	No-load maximum rpm	M	O	O	O	O	O
Lubrication system	Oil leak	I	O	O	O	O	O
	Oil level	I	O	O	O	O	O
	Clogging and dirt of oil filter	I	O	O	O	O	O
Fuel system	Fuel leak	I	O	O	O	O	O
	Operation of carburetor link mechanism	I	O	O	O	O	O
	Dirt and clogging of fuel filter and element	I	O	O	O	O	O
Cooling system	Coolant level in radiator and leak	I	O	O	O	O	O
	Rubber hose degradation	I	O	O	O	O	O
	Radiator cap condition	I	O	O	O	O	O
	Fan belt tension, looseness and damage	I	O	O	O	O	O
	Radiator rubber mount	I					O

Item		Inspection Period		1	3	6	12
		Months	Hours	170	500	1000	2000
POWER TRANSMISSION SYSTEM							
Differential	Leak	I	O	O	O	O	O
	Oil level	I	O	O	O	O	O
	Bolt loosening	T					O
Torque converter and transmission	Leak	I	O	O	O	O	O
	Fluid level	I	O	O	O	O	O
	Operating mechanism function and looseness	I	O	O	O	O	O
	Control valve and clutch functions	I	O	O	O	O	O
	Inching valve function	I	O	O	O	O	O
	Stall and hydraulic pressure measurement	M			O	O	
DRIVE SYSTEM							
Wheels	Tire cuts, damage and uneven wearing	I	O	O	O	O	O
	Loose hub nuts	T	O	O	O	O	O
	tire groove depth	M	O	O	O	O	O
	metal chips, pebbles and other foreign matter trapped in tire grooves	I	O	O	O	O	O
	Rim, side bearing and disc wheel damage	I	O	O	O	O	O
	Abnormal sound and looseness of front wheel bearing	I	O	O	O	O	O
	Abnormal sound and looseness of rear wheel bearing	I	O	O	O	O	O
Front axle	Cracks, damage and deformation of housing	I					O
Rear axle	Cracks, damage and deformation of beam	I					O
	Looseness of axle beam in vehicle longitudinal direction	M	O*				O
STEERING SYSTEM							
Steering wheel	Play and looseness	I	O	O	O	O	O
	Function	I	O	O	O	O	O
Gear box	Oil leak	I	O	O	O	O	O
	Looseness of mounting	T	O	O	O	O	O
Power steering	Oil leak	I	O	O	O	O	O
	Mounting and linkage looseness	I	O	O	O	O	O
	Damage of power steering hose	I					O

Item		Inspection Period	Months	1	3	6	12
		Hours	170	500	1000	2000	
Knuckle	King pin looseness	I	O	O	O	O	
	Cracks and deformation	I				O	
Steering wheel	Wheel alignment	M				O	
	Left and right turning angle	M				O	
BRAKING SYSTEM							
Brake pedal	Play and reserve	M	O	O	O	O	
	Braking effect	I	O	O	O	O	
Parking brake	Operating force	I	O	O	O	O	
	Braking effect	I	O	O	O	O	
	Rod and cable looseness and damage	I	O	O	O	O	
Brake pipe	Leak, damage and mounting condition	I	O	O	O	O	
Reservoir tank	Leak and fluid level	I	O	O	O	O	
Master cylinder and wheel cylinder	Function, wear, damage, leak and mounting looseness	I				O	
Brake drum and brake shoe	Clearance between drum and lining	M	O	O	O	O	
	Wear of shoe sliding portion and lining	I				O	
	Drum wear and damage	I				O	
	Shoe operating condition	I				O	
	Anchor pin rusting	I				O	
	Return spring fatigue	M				O	
	Automatic adjuster function	I				O	
Backing plate	Deformation, cracks and damage	I				O	
	Loose mounting	T				O	
MATERIAL HANDLING SYSTEM							
Forks	Abnormality of fork and stopper pin	I	O	O	O	O	
	Misalignment between left and right fork fingers	I	O	O	O	O	
	Cracks at fork root and welded part	I*3				O	
Mast and fork bracket	Deformation and damage of each part and crack at welded part	I	O	O	O	O	
	Mast and lift bracket looseness	I	O	O	O	O	
	Wear and damage of mast support bush	I				O	
	Wear, damage and rotating condition of rollers	I	O	O	O	O	

Item		Inspection Period				
		Months	1	3	6	12
		Hours	170	500	1000	2000
Mast and fork bracket	Wear and damage of roller pins	I				O
	Wear and damage of mast strip	I	O	O	O	O
Chain and chain wheel	Tension, deformation and damage of chain	I	O	O	O	O
	Chain lubrication	I	O	O	O	O
	Abnormality of chain anchor bolt	I	O	O	O	O
	Wear, damage and rotating condition of chain wheel	I	O	O	O	O
Various attachments	Abnormality and mounting condition of each part	I	O	O	O	O
HYDRAULIC SYSTEM						
Cylinder	Loosening and damage of cylinder mounting	I	O	O	O	O
	Deformation and damage of rod, rod screw and rod end	I	O	O	O	O
	Cylinder operation	I	O	O	O	O
	Natural drop and natural forward tilt (hydraulic drift)	M	O	O	O	O
	Oil leak and damage of cylinder mounting	I	O	O	O	O
	Wear and damage of pin and cylinder bearing	I	O	O	O	O
	Lifting speed	M	O	O	O	O
	Uneven movement	I	O	O	O	O
Oil pump	Oil leak and abnormal sound	I	O	O	O	O
Hydraulic oil tank	Oil level and contamination	I	O	O	O	O
	Tank and oil strainer	C			O	O
	Oil leak	I	O	O	O	O
Control lever	Loose linkage	I	O	O	O	O
	Operation	I	O	O	O	O
Oil control valve	Oil leak	I	O	O	O	O
	Relief pressure measurement	M				O
	Relief valve and tilt lock valve functions	I	O	O	O	O
Hydraulic piping	Oil leak	I	O	O	O	O
	Deformation and damage	I	O	O	O	O
	Loose joint	T	O	O	O	O

Inspection Period		Months	1	3	6	12
		Hours	170	500	1000	2000
Item						
ELECTRICAL SYSTEM						
Ignition timing	Cracks on distributor cap	I	O	O	O	O
	Spark plug burning and gap	I	O	O	O	O
	Distributor side terminal burning	I	O	O	O	O
	Distributor cap center piece wear and damage	I	O	O	O	O
	Plug cord internal discontinuity	I				O
	Ignition timing	M			O	O
Starting motor	Pinion gear meshing status	I	O	O	O	O
Charger	Charging function	I	O	O	O	O
Battery	Battery fluid level	I	O	O	O	O
	Battery fluid specific gravity	M			O	O
Electrical wiring	Damage of wiring harness	I	O	O	O	O
	Fuses	I	O	O	O	O
SAFETY DEVICES, ETC.						
Head guard	Cracks at welded portion	I	O	O	O	O
	Deformation and damage	I	O	O	O	O
Back-rest	Loosening of mounting	T	O	O	O	O
	Deformation, crack and damage	I	O	O	O	O
Lighting system	Function and mounting condition	I	O	O	O	O
Horn	Function and mounting condition	I	O	O	O	O
Direction indicator	Function and mounting condition	I	O	O	O	O
Instruments	Functions	I	O	O	O	O
Backup buzzer	Function and mounting condition	I	O	O	O	O
Rear-view mirror	Dirt. damage	I	O	O	O	O
	Rear reflection status	I	O	O	O	O
Seat	Loosening and damage of mounting	I	O	O	O	O

<div> <div>Item</div> <div>Inspection Period</div> </div>		Months	1	3	6	12
		Hours	170	500	1000	2000
Body	Damage and cracks of frame, cross members, etc.	I				O
	Bolt looseness	T				O
Others	Grease up	L	<i>O</i>	<i>O</i>	<i>O</i>	<i>O</i>

PERIODIC REPLACEMENT LUBRICANTS AND PARTS

● : Replacement

Interval	1 month	3 months	6 months	12 months
	170 hours	500 hours	1000 hours	2000 hours
Engine	●	●	●	●
Engine oil filter		●	●	●
Engine coolant (every 2 years for LLC)		●	●	●
Fuel filter			●	●
Torque converter oil			●	●
Torque converter oil filter				●
Differential oil				●
Hydraulic oil			●	●
Hydraulic oil filter	●*1		●	●
Wheel bearing grease				●
Spark plugs			●	●
Cyclone air cleaner element				●
Brake master cylinder rubber parts				●
Cups and seals for master and wheel cylinders				●
Brake fluid			●	●
Power steering hoses				●*2
Power steering rubbers parts				●*2
Hydraulic hoses				●*2
Reservoir tank tube				●*2
Fuel hoses				●*2
Torque converter rubber hoses				●*2
Chains				●*3

*1 : for new vehicle *2 : Every 2 years *3 : Every 3 years

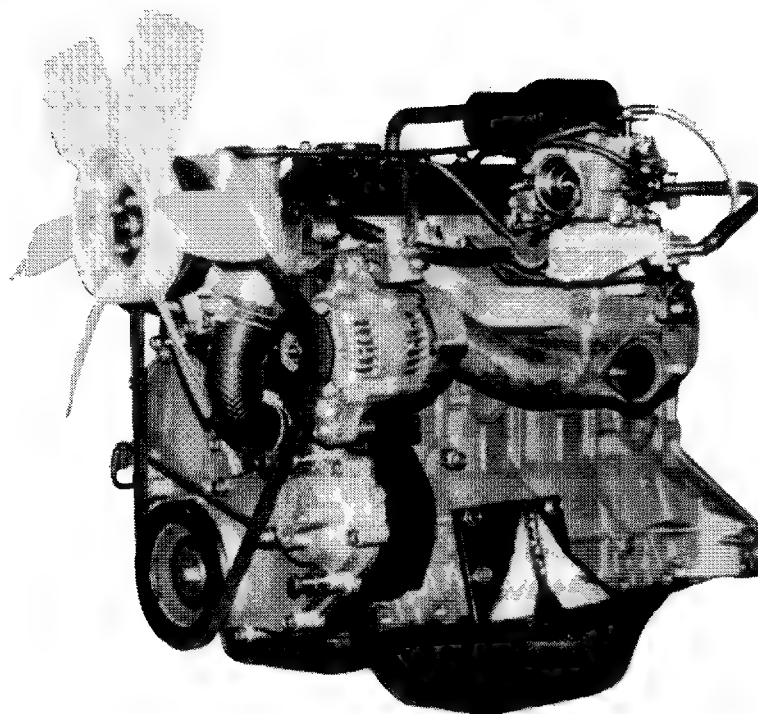
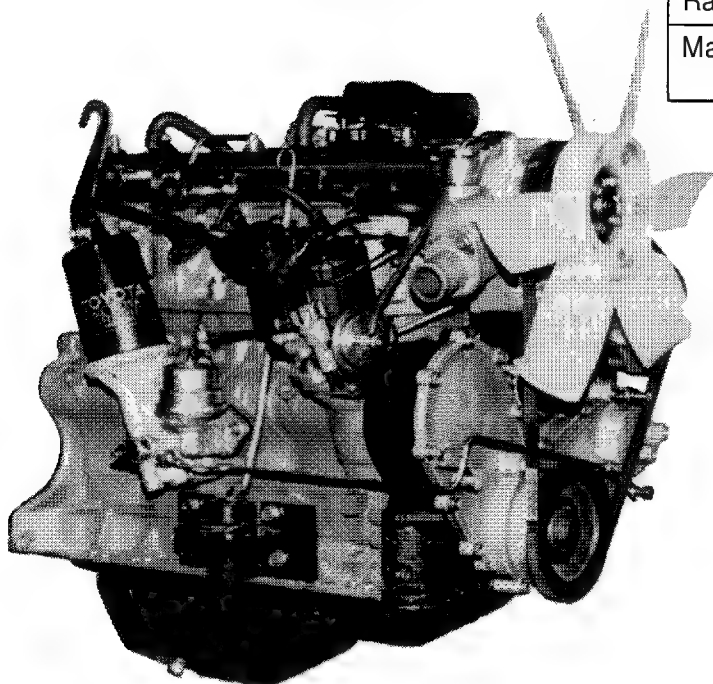
Replacement shall be made upon arrival of the operation hours or months, whichever is earlier.

ENGINE

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GENERAL

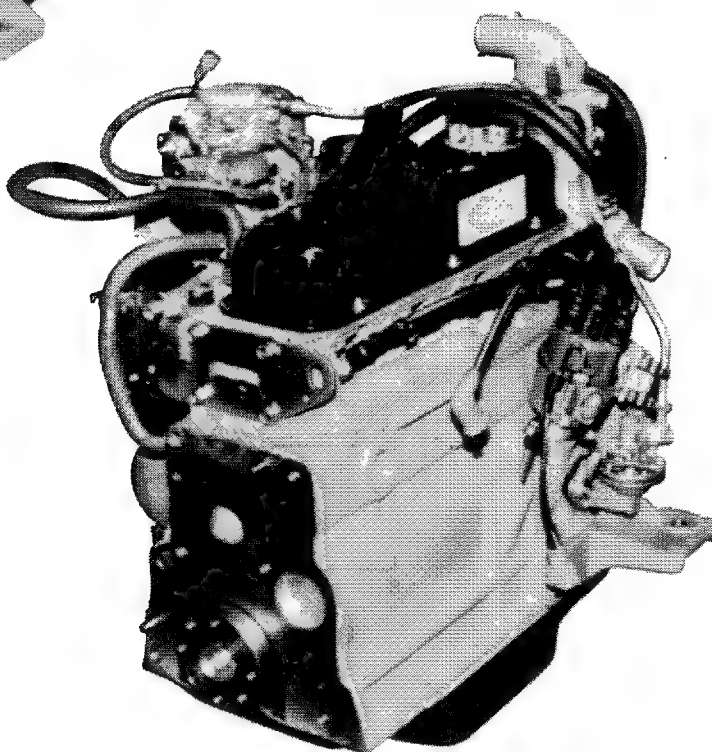
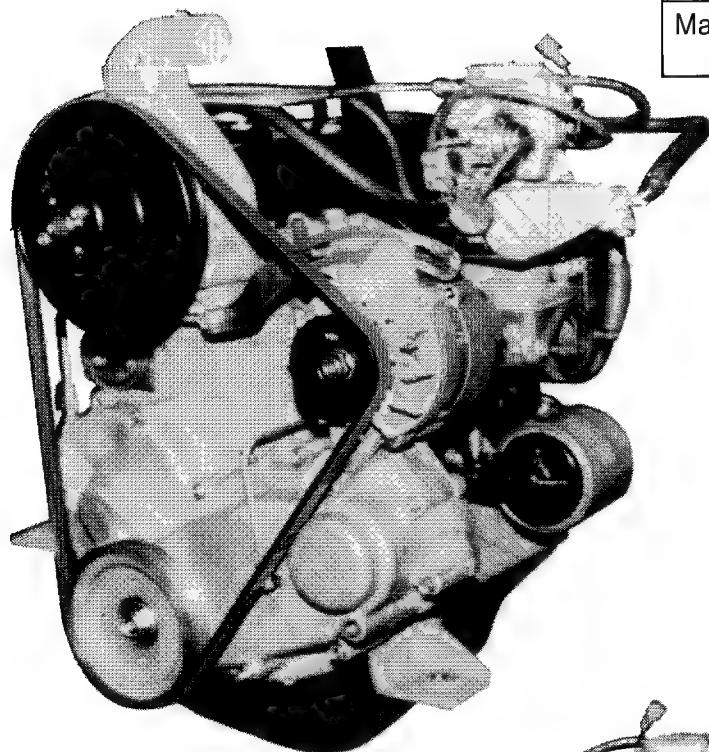
Engine performances	
Piston displacement (cc)	2237
No-load static maximum speed (rpm)	2450 ± 50
Rated output (PS/rpm)	45/2100
Maximum torque (kg-m/rpm)	16.5/1800



4Y Engine Exterior View

KAJ14-2.6

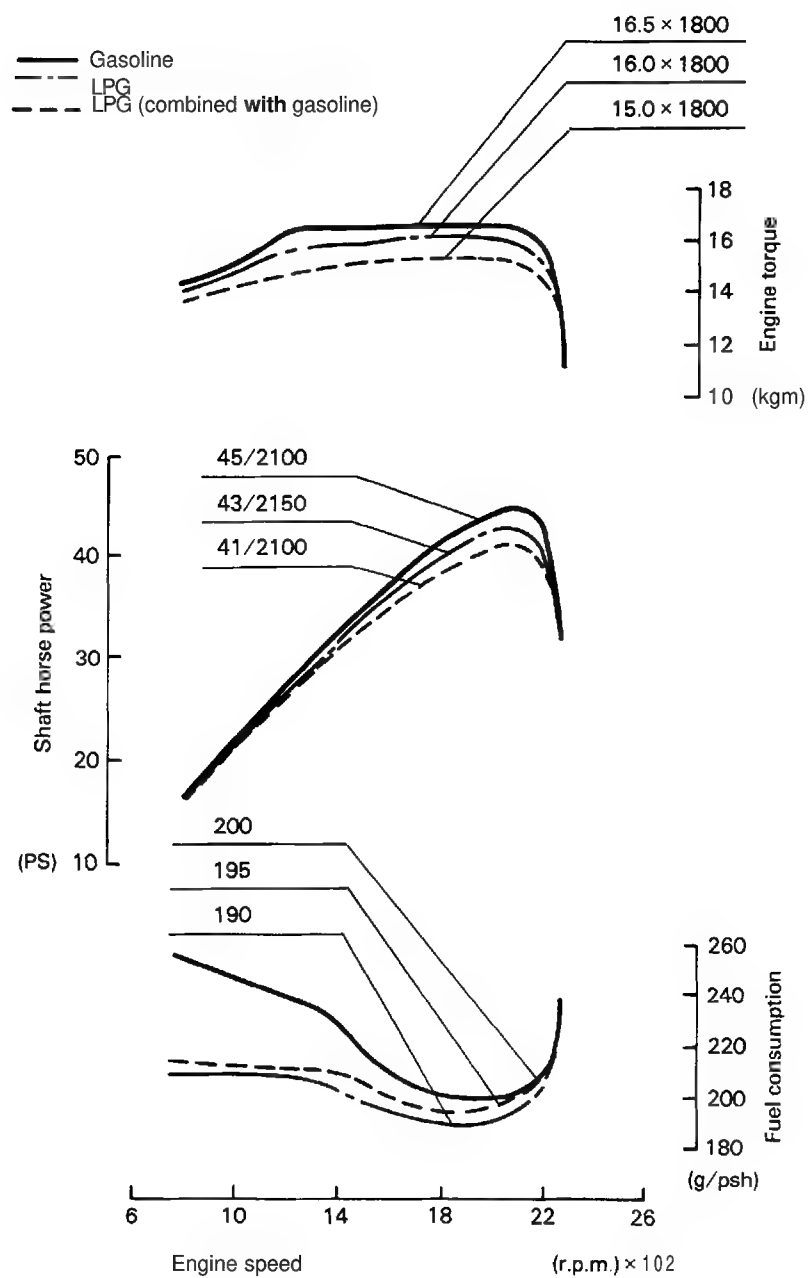
Engine performances	
Piston displacement (cc)	1493
No-load static maximum speed (rpm)	2900 ± 50
Rated output (PS/rpm)	33/2650
Maximum torque (kg-m/rpm)	10.5/1800



4P Engine Exterior View

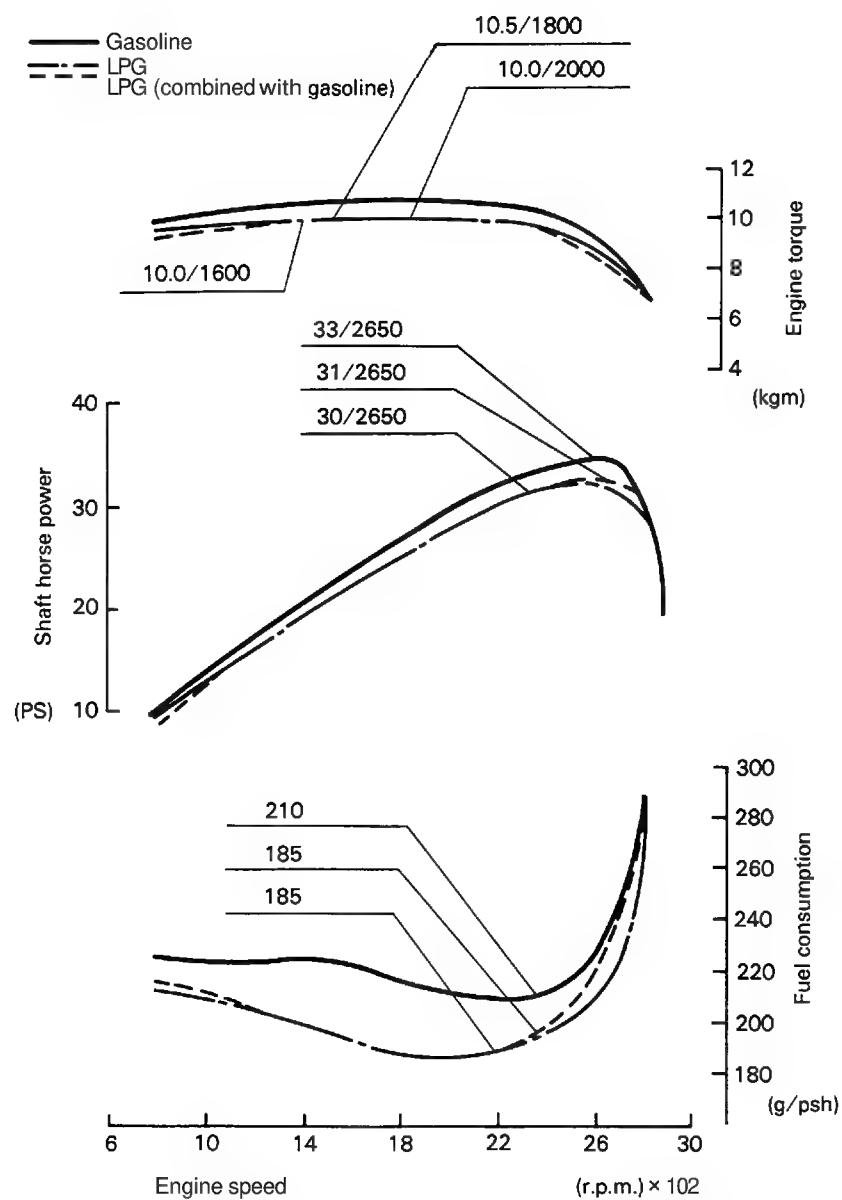
KAF1-1.6

ENGINE PERFORMANCE CURVES



4Y Engine Performance Curves

LARM1



4P Engine Performance Curves

LARM2

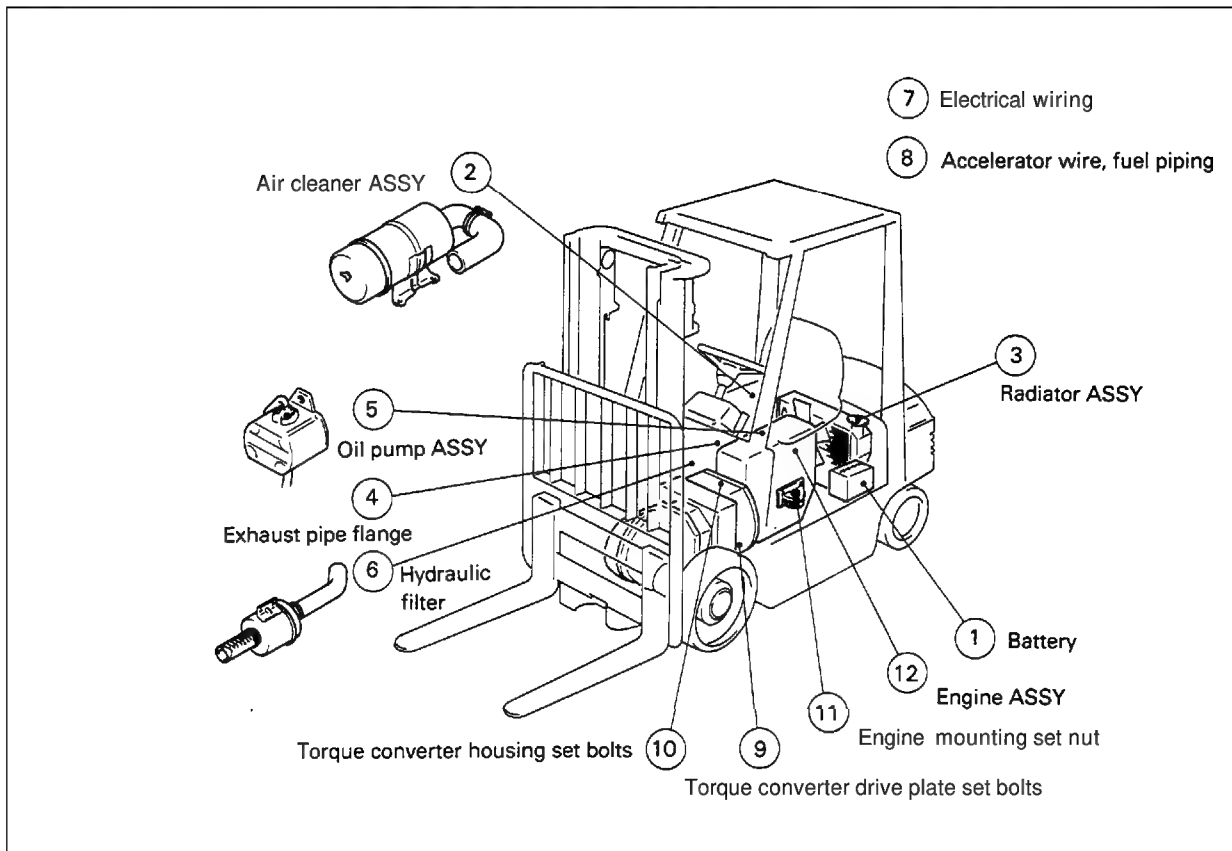
ENGINE ASSEMBLY REMOVAL & INSTALLATION

Preparation

1. Place the vehicle in the pit (to enable operation from the bottom side).
2. Fully lower the fork.
3. Remove the toe board.
4. Remove the engine hood.
5. Drain the coolant (from the radiator and engine).

Removal & Installation

(The numbers indicate the removing sequence. The sequence for installation is the reverse.)



Removal Operation

LARM35

Removal & Installation Procedure

1. Battery ASSY and battery case **(Point 1)**
2. Air cleaner ASSY **(Point 2)**
3. Radiator ASSY and fan shroud **(Point 3)**
4. Exhaust pipe
5. Oil pump ASSY **(Point 4)**
6. Hydraulic oil filter w/hose
7. Electrical wiring (including bond cable)
8. Accelerator wire and fuel piping
9. Torque converter drive plate set bolts **(Point 5)**
10. Torque converter housing set bolts **(Point 6)**
11. Engine mounting set nuts
12. Engine ASSY **(Point 7)**

Notes for Engine ASSY Removal & Installation
(R: Note for removal I: Note for installation)

Point 1

1. Battery ASSY
 - R: Disconnect the negative \ominus terminal first.
 - I: Connect the negative @terminal later.

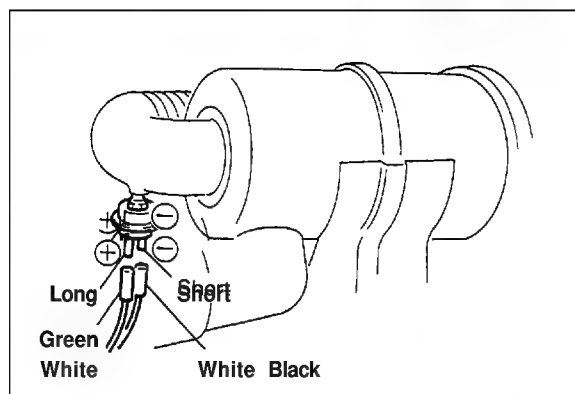


Removing the Battery

LAR25-23

Point 2

2. Air cleaner ASSY
 - R: Make a note on the vacuum switch wiring.
 - I: Carefully connect the vacuum switch wiring correctly.

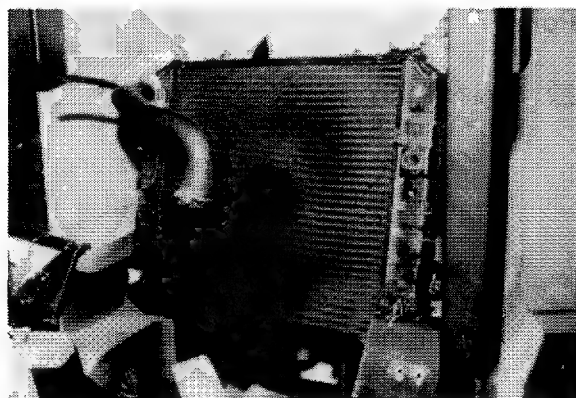


Removing & Installing the Air Cleaner ASSY

LAOS352

Point 3

3. Radiator ASSY and fan shroud
 - R, I: Carefully operate during installation and removal to prevent the radiator fin from being damaged.

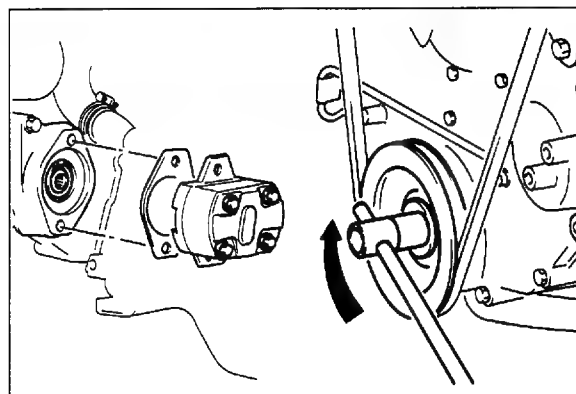


Removing & Installing the Radiator ASSY

LAR25-17

Point 4

5. Oil pump ASSY
 - R: Always use a new packing.
 - I: When inserting the oil pump shaft into the flange, rotate the crankshaft for easier insertion.

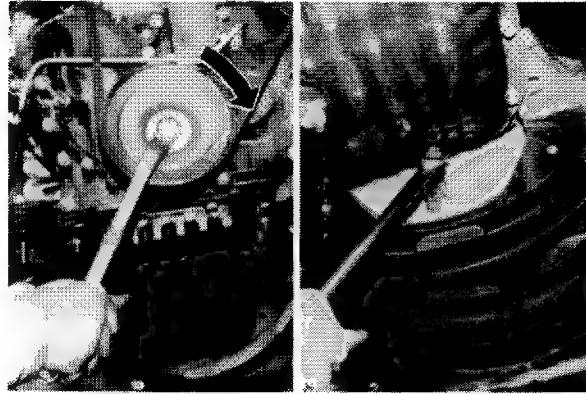


Installing the Oil Pump ASSY

LARS36.37

Point 5

9. Torque converter drive plate set bolts
R, I: Rotate the crankshaft to rotate the drive plate.

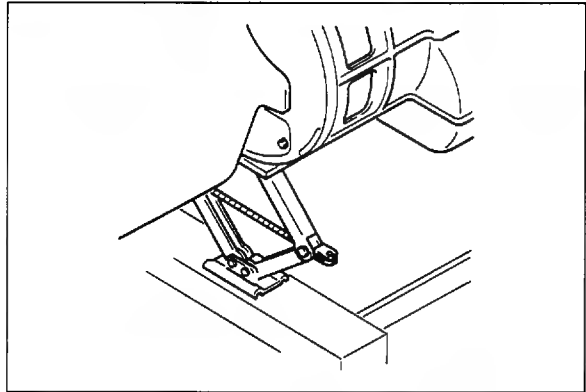


Removing the Drive Plate Set Bolt

LAR28-2,27-35

Point 6

10. Torque converter housing set bolts
R, I: Place a support allowing height adjustment under the torque converter housing.



Placing a Support

LARS38

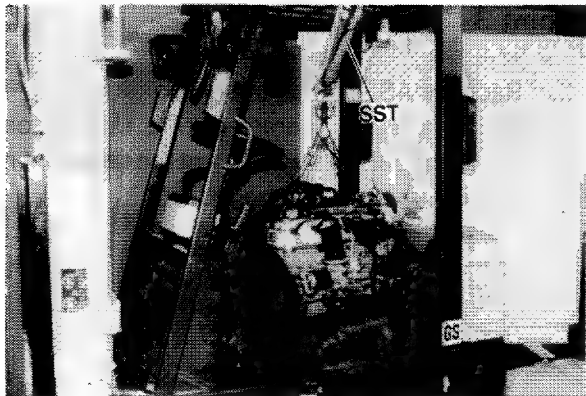
Point 7

12. Engine ASSY
R, I: Use SST 09010-20111-71.
Operate carefully to prevent functional parts from being damaged.

Engine ASSY weight

4Y engine: 134 kg (294.8 lbs)

4P engine: 128 kg (281.6 lbs)



SST

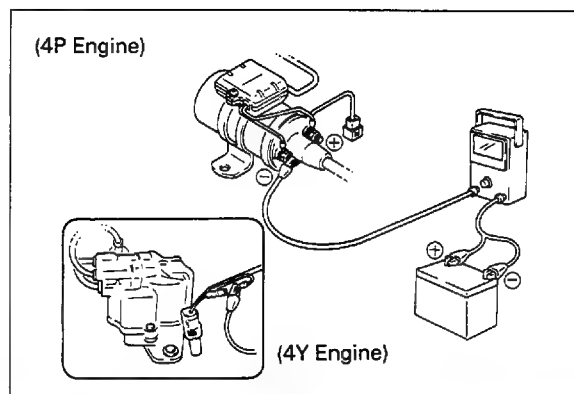
LAR28-8

Jobs after Installation

1. Fill the coolant.
Coolant amount: 11.5 ℓ (3.04 US gal)
2. Check the engine oil quantity.
Engine oil quantity
4Y engine: 4.0 ℓ (1.06 US gal)
4P engine: 4.3 ℓ (1.14 US gal)
3. Check the electrical wiring and fuel piping.
4. Engine tune-up
See page 1-9.

ENGINE TUNE-UP

1. Idle speed adjustment
 - (1) Warm up the engine until the coolant temperature reaches 75 ~ 85°C (167 ~ 185°F).
 - (2) Set the engine tachometer.



Setting the Engine Tachometer

LAOS432

- (3) Disconnect the idle-up actuator hose.
- (4) Turn the adjusting screw to adjust the speed to the standard level.

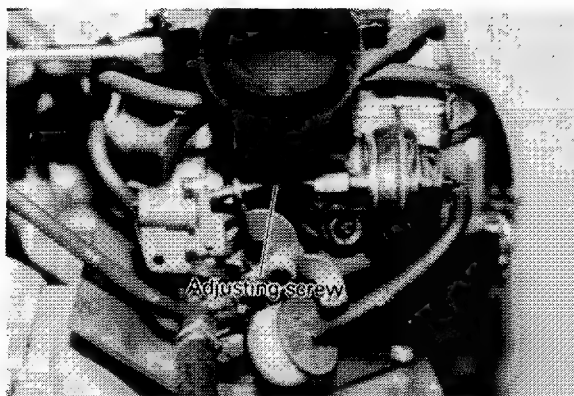
1250 ± 25 rpm

To increase the speed:

Clockwise turn

To decrease the speed:

Counter clockwise turn



Adjusting the Idle-up Actuator

KAJ14-22

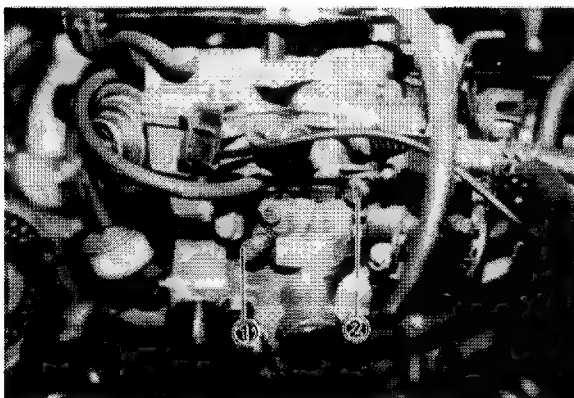
- (5) Connect the idle-up actuator hose.
- (6) Alternately turn the carburetor idle adjusting screw 1) and throttle adjusting screw 2) for adjustment to the specified idling speed:

Standard idling speed:

650 ⁺⁵⁰/₋₀ rpm

Idle vacuum: 400 mmHg or more

675 RPM
W/ LPG FUEL SYSTEM
T/C MODELS
GE 9004 2/



Adjustment the Idling Speed

LAR39-1

- (7) If the speed does not drop when the idle adjusting screw is loosened, return the adjusting screw of the idle-up actuator rod to the idling speed.

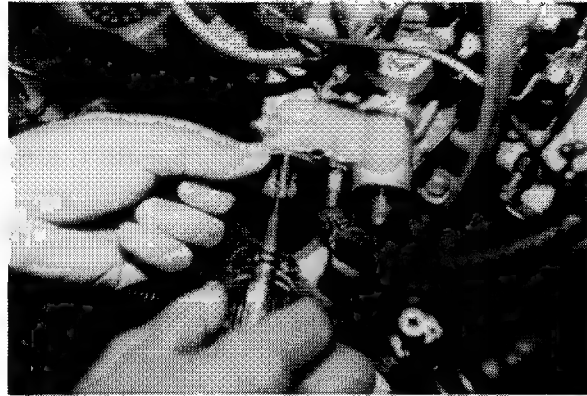


Adjusting the Idle-up Actuator

LAR39-6

Maximum speed adjustment

- (1) Warm up the engine until the coolant temperature rises to 75 — 85°C and hydraulic oil temperature reaches 50°C.
- (2) Install the engine tachometer. Depress the accelerator pedal fully and adjust the maximum speed by using the air governor adjusting nut and screw.
 - 4Y engine: 2450 ± 50 rpm
 - 4P engine: 2900 ± 50 rpm



Adjusting the Maximum Speed

LAR39-4

- (3) Operate the material handling lever, and measure the engine speed at fully relief.

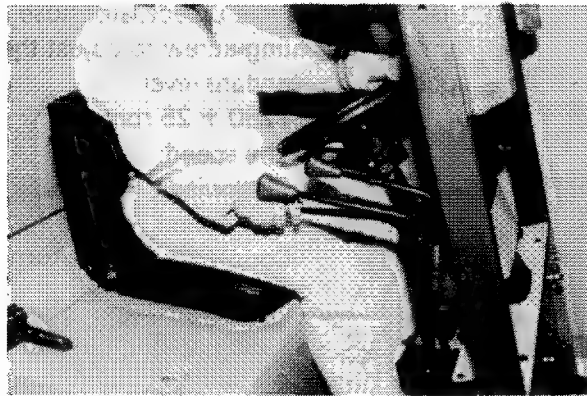
Engine speed decrement at fully relief:

4Y engine within 300 rpm

4P engine within 350 rpm

If the speed decrement exceeds the above value, adjust the speed by using the air governor adjusting nut and screw.

- (4) After the end of adjustment, seal the adjusting nut and screw.



Measuring the Engine Speed at Full Relief

LAR40-30

Notes:

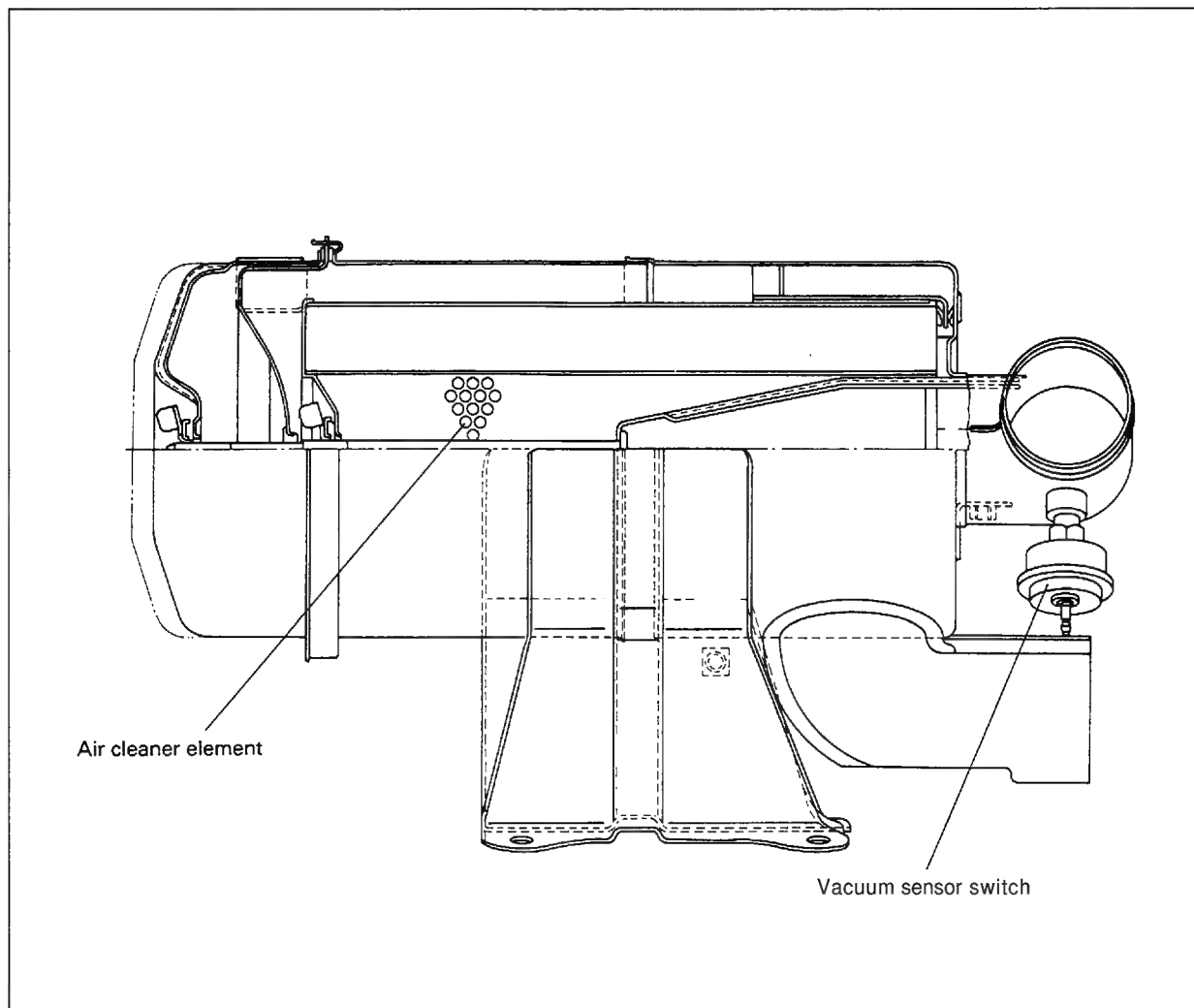
- Turn the adjusting nut clockwise to increase the engine speed.
(After turning the adjusting nut, lightly tap it toward the body side for fixing.)
- Turn the screw clockwise to increase the engine speed.
- If the engine speed decrement at fully relief is excessive, turn the adjusting nut clockwise and the adjusting screw counterclockwise. This adjustment will cause engine hunting, so stop immediately before hunting occurs.
- If the engine revolution at the maximum speed fluctuates (hunting), turn the adjusting nut counterclockwise and the **adjusting** screw clockwise.
Excessive turning will increase the engine speed decrement at full relief which may also cause hunting.
- The engine speed decrement at full speed should be about 200 rpm in a new vehicle.
If it exceeds 350 rpm, adjust the engine, carburetor and air governor.
- Seal the governor after the adjustment.

AIR CLEANER

The air intake system for the engine is of the snorkel type which takes in clean open air from the top of the head guard pillar.

The air flowing in through the inlet passes inside the pillar and is filtered through the air cleaner before entering the engine.

A 6-inch cyclone air cleaner with vacuum sensor is adopted. When the air cleaner gets clogged, the vacuum sensor causes the warning lamp of the combination meter to come on to warn the operator of the clogging of air cleaner.



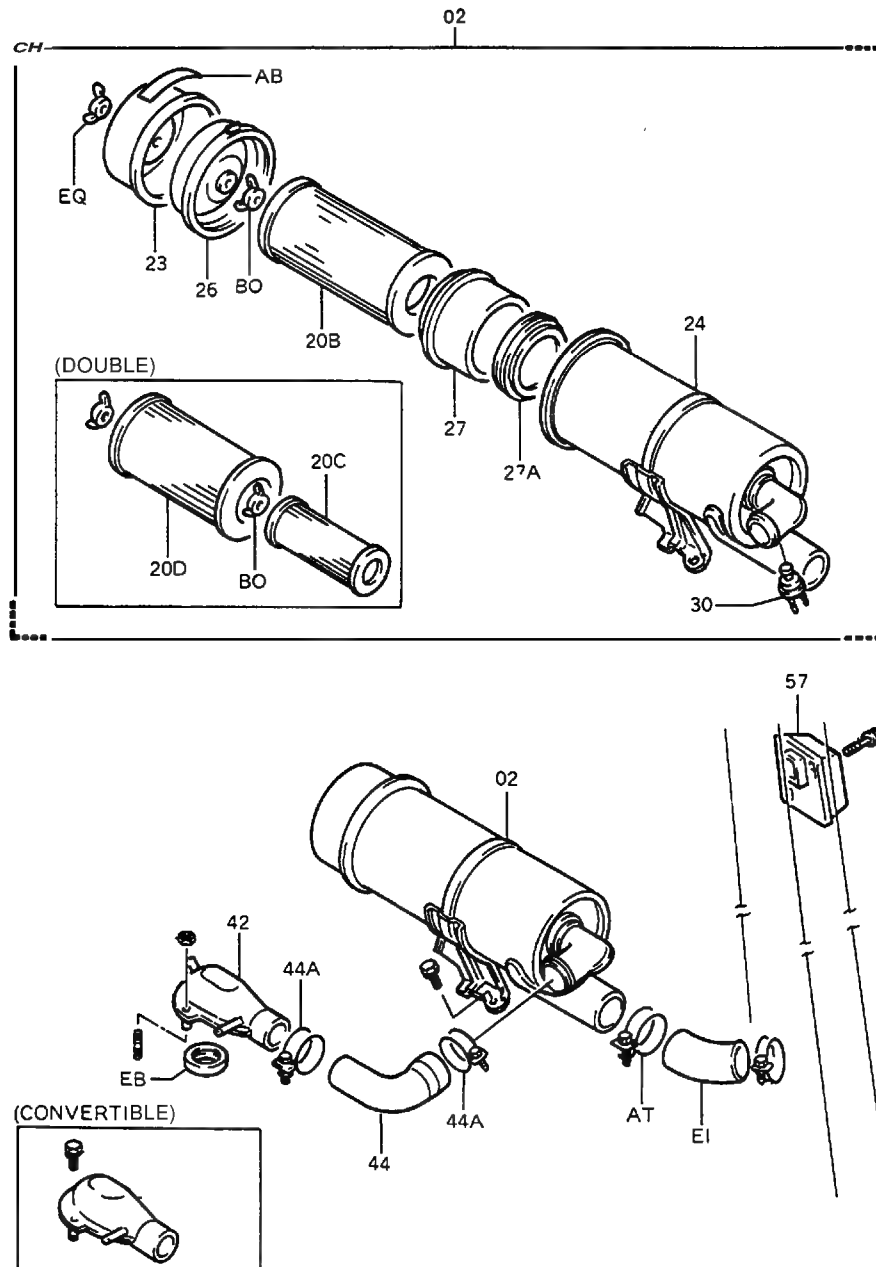
Air Cleaner Sectional View

LAOM5

SPECIFICATIONS

Type	Combined type (dry + cyclone)
Size	6 in.
Air intake system	Open air intake
Filtering area	14.200 cm ²
Vacuum sensor operating pressure	-44.1 mm Hg

COMPONENTS

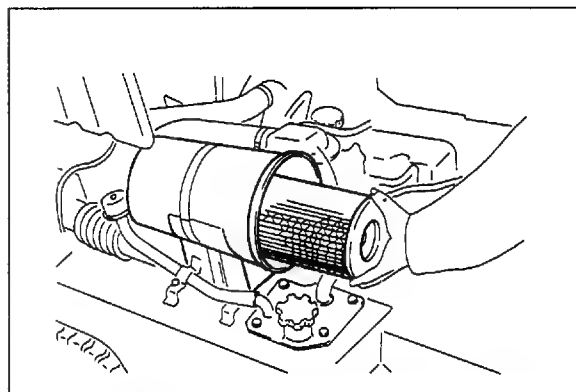


- | | | | |
|-----|--|-----|---------------------------------|
| 02 | Cleaner ASSY, cyclone air | 42 | Connector, air cleaner |
| 20B | Element SUB-ASSY, cyclone air cleaner | 44 | Hose, air cleaner, outlet No. 1 |
| 20C | Element SUB-ASSY, cyclone air cleaner, inner | 44A | Clamp |
| 20D | Element SUB-ASSY, cyclone air cleaner, outer | 57 | Louver, air inlet |
| 23 | Case SUB-ASSY, air cleaner | AB | Plate, caution |
| 24 | Cap SUB-ASSY, air cleaner | AT | Clamp, hose |
| 26 | Cup, dust | BO | Nut, wing |
| 27 | Wing, cyclone | EB | Seal |
| 27A | Gasket, filter element | EI | Hose, air cleaner |
| 30 | Switch ASSY, vacuum | EQ | Nut, wing |

INSPECTION

Air Cleaner Element Inspection and Cleaning

1. Open the engine hood and remove the air cleaner cap.
2. Remove the element.



Removing the Element

LAOS368

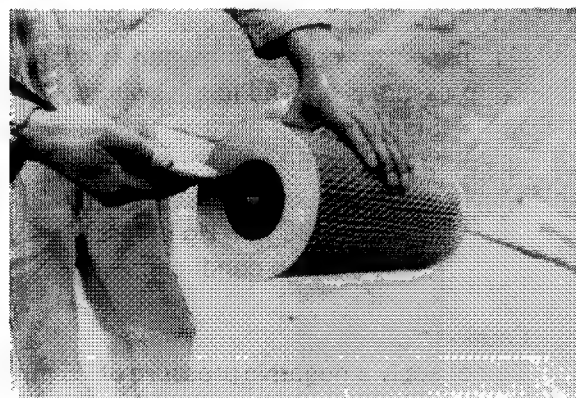
3. Remove the dust cup and clean the dirt accumulated in the air cleaner cap.



Cleaning the Air Cleaner Cap

LAOS190-7

4. Element cleaning
 - (1) For cleaning in ordinary status, blow compressed air (7 kg/cm² or less) from the inside of the element along the pleats. If the element is heavily contaminated, washing is possible.
 - (2) Element washing method
Dissolve a neutral detergent in tepid water (about 40°C). Immerse the element for about 30 minutes in the washing liquid, and then rinse it thoroughly with clean water. (The water pressure must be 2.8 kg/cm² or less.)



Cleaning the Element

LAO190-6

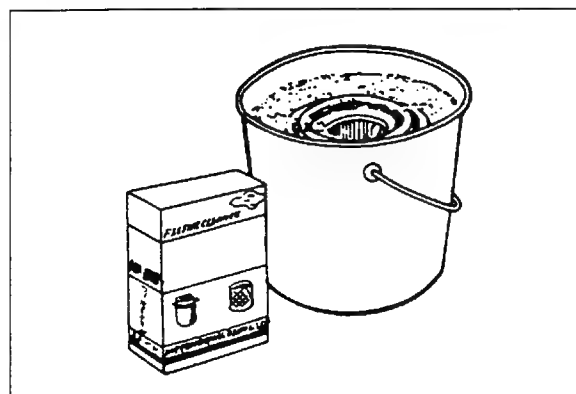
Caution:

Carefully protect the filtering paper from damage during washing.

After washing, dry it by standing or with a dryer (cold air).

Caution:

Do not use compressed air or hot air for drying.



Washing the Element

JABM6

5. Element inspection

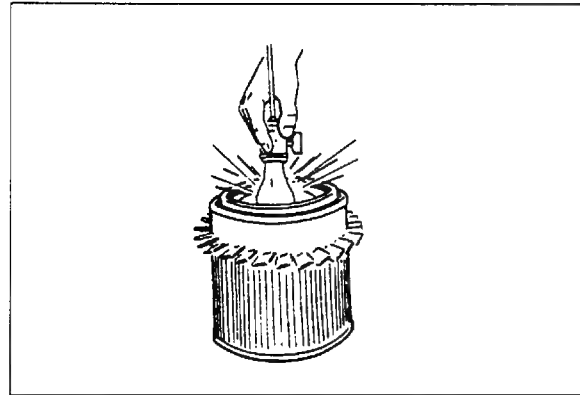
After cleaning, put an electric bulb in the element and inspect the element for damage. If any pinhole, tear or damage is found, replace it with a new element.

6. Element replacement

Replace the element after washing 6 times or every 12 months in general cases.

Caution:

Check the element and cyclone fin rubber seal to see that they are free from any surface defect, and tighten the wing nut to a torque at 20 kg-cm (1.45 lbs) or more.



Inspecting the Element

JABM7

Clogging Warning System Inspection

1. Warning lamp inspection

- (1) Check that the air cleaner warning lamp comes on when the engine switch is turned to ON and goes off when the engine starts.



Inspecting the Warning Lamp

LAOS351

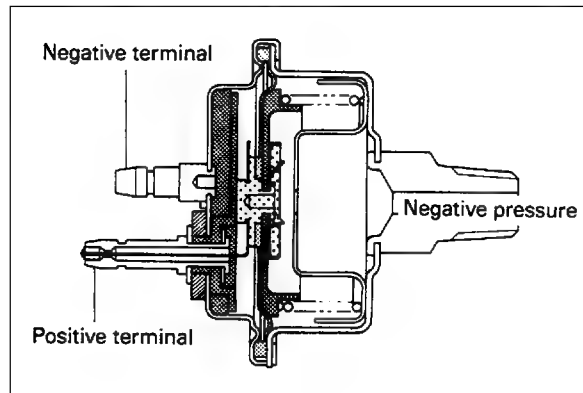
2. Individual vacuum switch inspection

- (1) Inspect the conduction when a negative pressure is applied to the switch.

Standard

at approx. 50 mm Hg or above:
conduction

at approx. 35 mm Hg or less:
no conduction



Inspecting the Individual Vacuum Switch

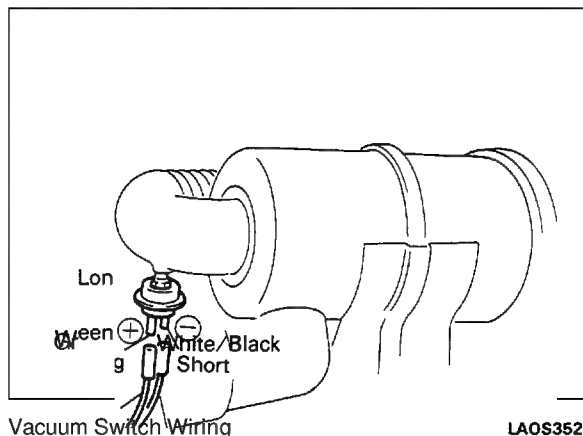
SAES81

Caution:

Do not apply a negative pressure of 75 mm Hg or more to the vacuum switch.

3. Vacuum switch wiring

- (1) When connecting the cables, correctly connect to the positive and negative terminals. Reversed connection does not blow the fuse, but the warning lamp does not come on.



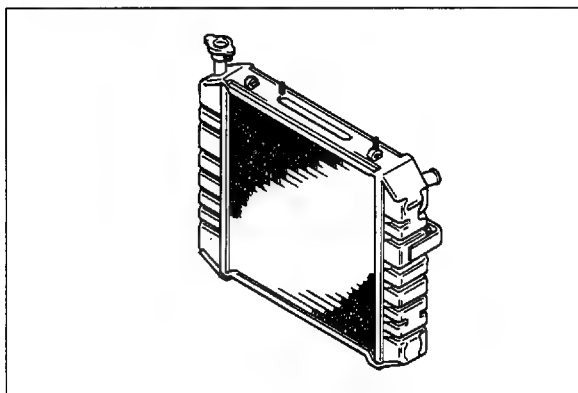
Vacuum Switch Wiring

LAOS352

RADIATOR

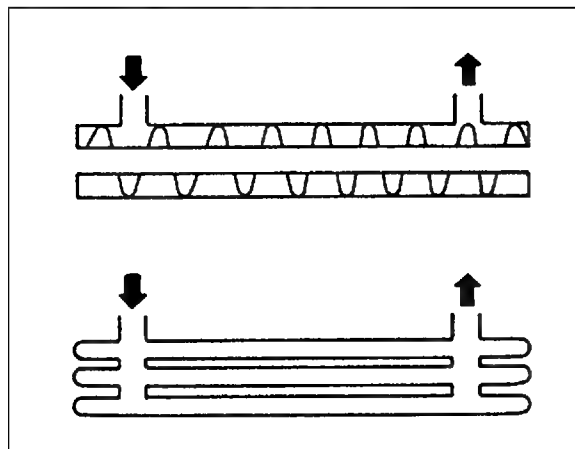
GENERAL

A corrugate crossflow type radiator with built-in torque converter cooler is adopted.



Radiator

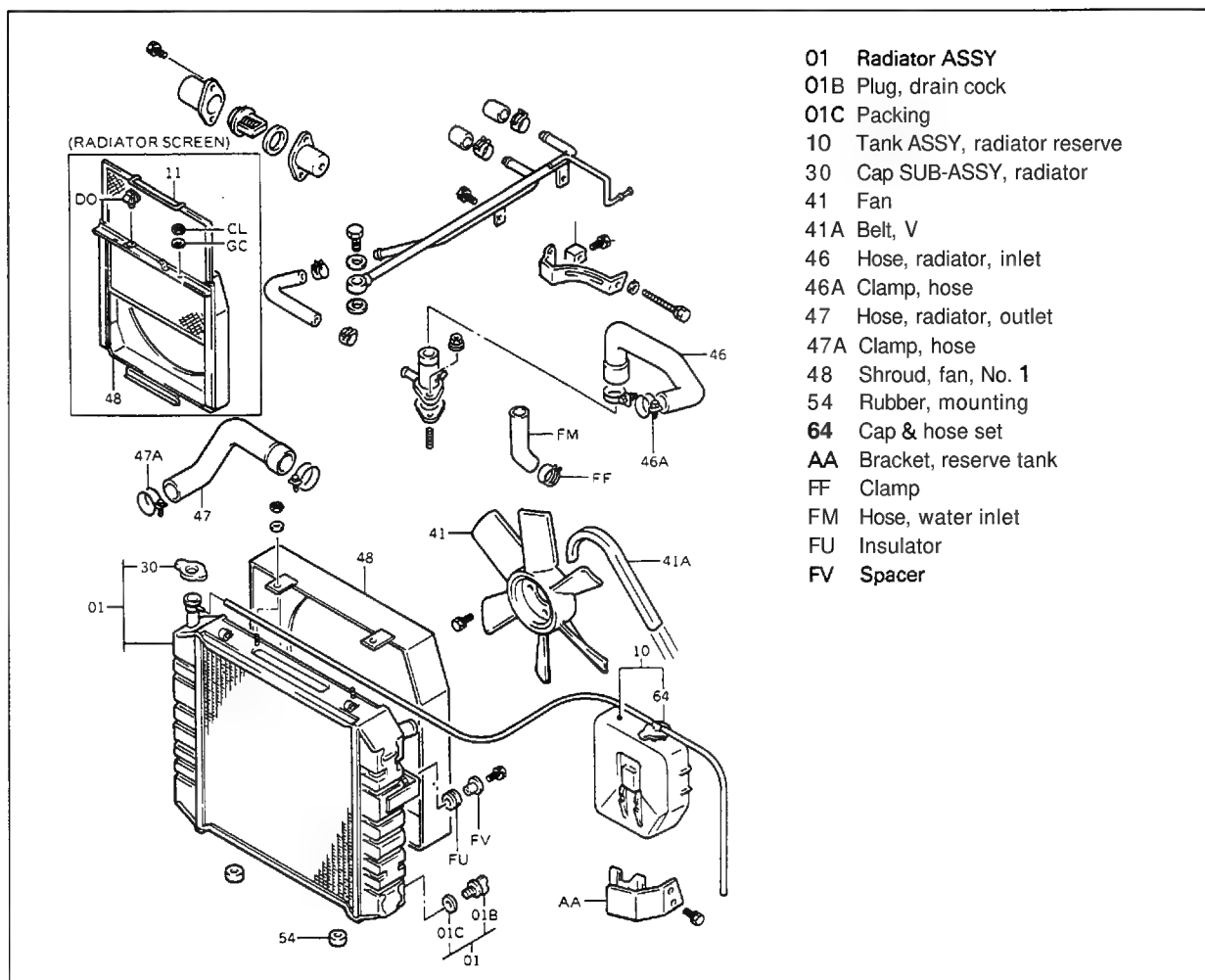
LARS39



Torque Converter Cooler

LAOS23

COMPONENTS



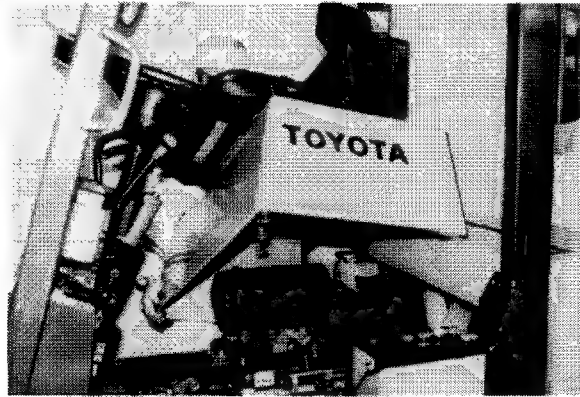
Radiator Components (For 4Y engine)

LARM37

REMOVAL

Engine hood and radiator cover removal

- (1) Disconnect the engine hood damper and stay.
- (2) Remove engine hood hinge set screws (2 pcs. on each side), and remove the engine hood.
- (3) Loosen the knobs on both sides of the radiator cover, and remove the radiator cover.

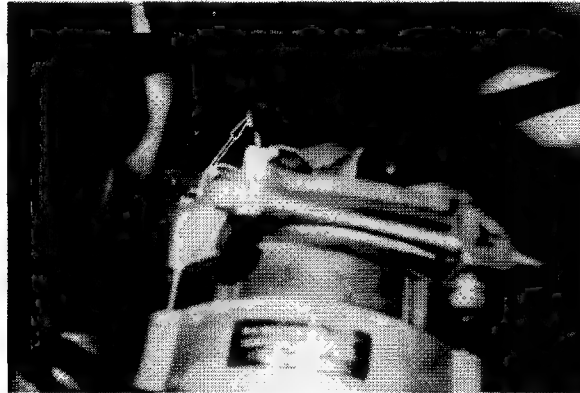


Removing the Engine Hood

LAR26-10

Coolant draining

- (1) Remove the radiator drain cock to drain the coolant.

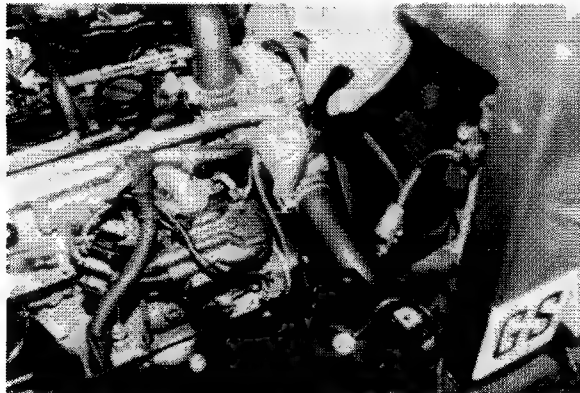


Draining the Coolant

LAR39-9

Radiator hose disconnection

- (1) Disconnect the reserve tank hose.
- (2) Disconnect the inlet and outlet hoses from the engine.
- (3) Disconnect the torque converter cooler hoses. Put tags showing inlet and outlet to the disconnected hoses.



Disconnecting the Radiator Hoses

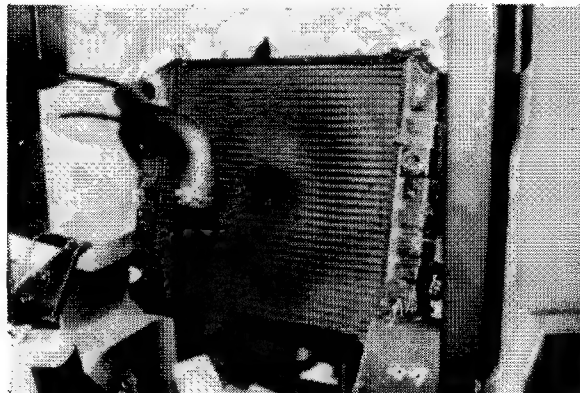
LAR26-28

Radiator removal

- (1) Remove the fan shroud set bolts.
- (2) Remove the radiator set bolts (one each at left and right), and remove the radiator.

Caution:

- Move the fan shroud toward the engine.
- Carefully operate to prevent damage to the radiator fin.



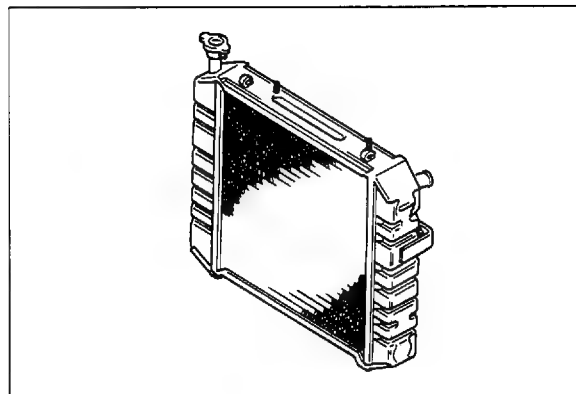
Removing the Radiator

LAR26-35

INSPECTION

1. Radiator inspection

- (1) Damage to radiator fin
- (2) Deformation and corrosion at each part of radiator

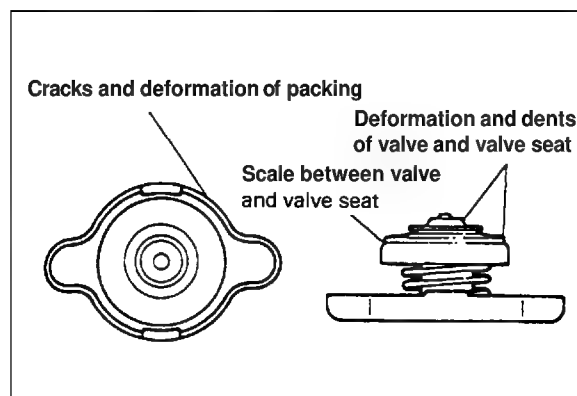


Inspecting the Radiator

LARS39

2. Radiator cap visual check

- (1) Cracks and deformation of packing.
- (2) Deformation and dents of valve and valve seat.
- (3) Scale between valve and valve seat.

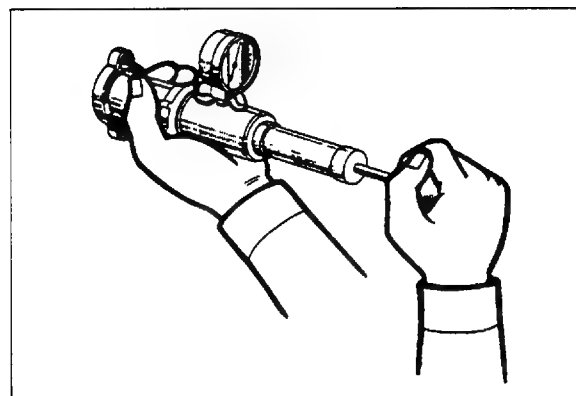


Inspection the Radiator Cap (1)

LAOS353

3. Radiator cap opening pressure inspection

- (1) Install a cap tester to the radiator cap. and inspect the valve opening pressure.
 Standard: $0.75 \sim 1.05 \text{ kg/cm}^2$
 Limit : 0.6 kg/cm^2

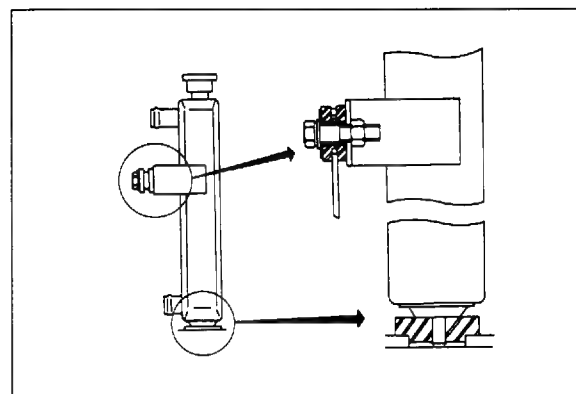


Inspection the Radiator Cap (2)

LAOS354

4. Radiator mounting rubber inspection

- (1) Cracks and deformation of mounting rubber
- (2) Inspect the radiator mounting rubber every 12 months, and replace it if it is hardened or elasticity is lost.



Inspection the Mounting Rubber

LARS55

INSTALLATION

The installation procedure is the reverse of the removal procedure.

Caution:

- Do not mistake the torque converter cooler inlet and outlet hoses when connecting them.
- The specified quantity of coolant cannot be filled in the radiator in a single step. Add coolant after starting the engine once.
- Supply coolant to the specified level in the reserve tank, too.
- For the 4Y engine vehicle, always bleed the air by loosening the air bleeder on top of the water pump.



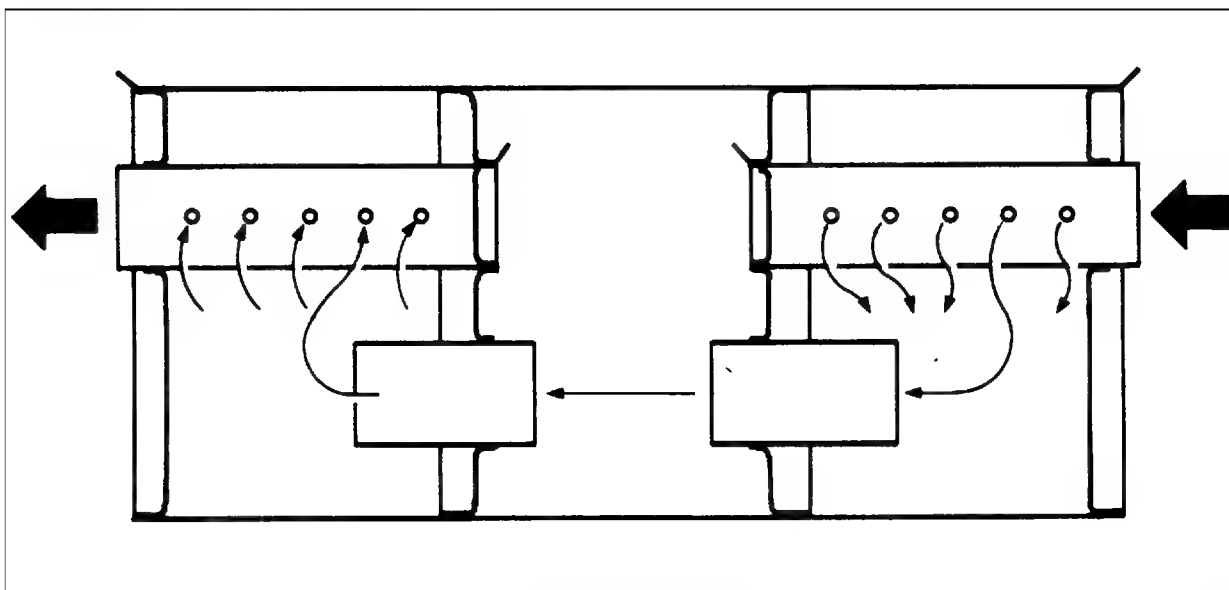
Filling Coolant



LAR39-19,18

MUFFLER & EXHAUST PIPE

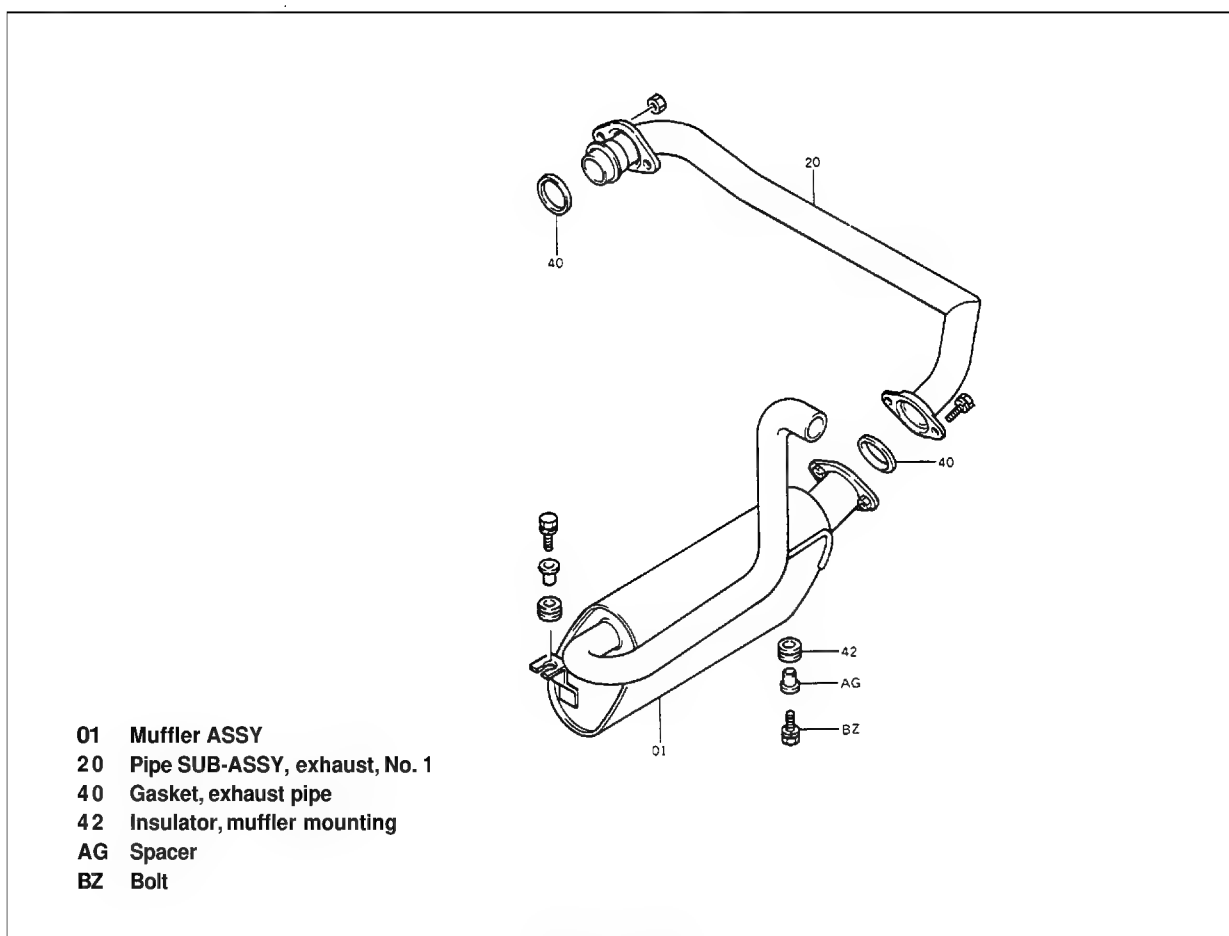
GENERAL



Muffler Sectional View

LARM38

COMPONENTS



Muffler Components

LARM39

REMOVAL

1. Rear weight removal

Caution:

Always remove the radiator cover before removing the weight.

- (1) Prepare proper wire rope and sling the weight as the preparation for hoisting.

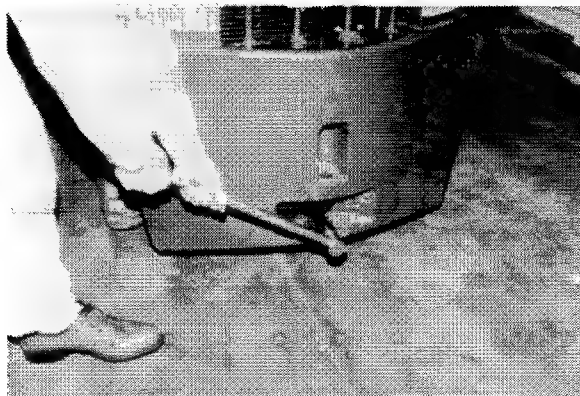
Weight of rear weight

1.0 ton model: 495 kg (1100 lbs)

1.25 ton model: 695 kg (1550 lbs)

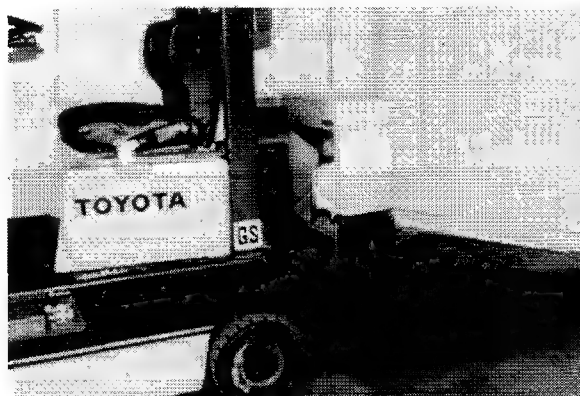
1.5 ton model: 895 kg (2000 lbs)

- (2) Remove the set bolts (width across flats: 46 mm).
- (3) Slowly operate the hoist upward to remove the weight.



Removing the Weight Bolts

LAR28-11

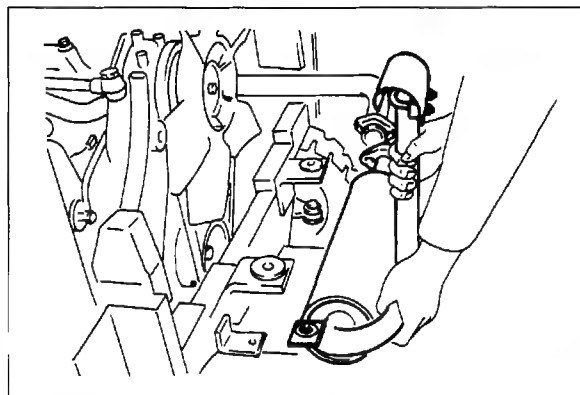


Removing the Rear Weight

LAR28-14

2. Muffler ASSY removal

- (1) Disconnect the exhaust pipe connecting flange.
- (2) Remove the muffler set bolts, and remove the muffler ASSY.

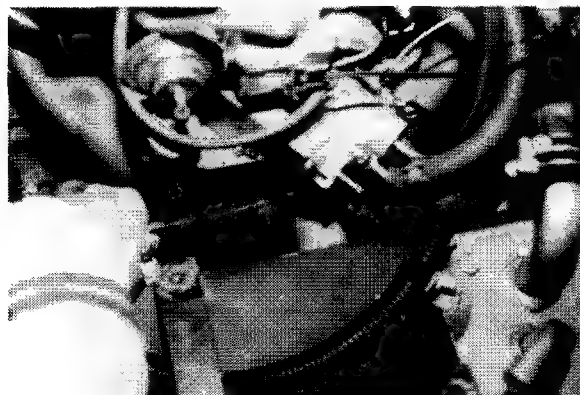


Removing the Muffler ASSY

LARS43

Exhaust pipe removal

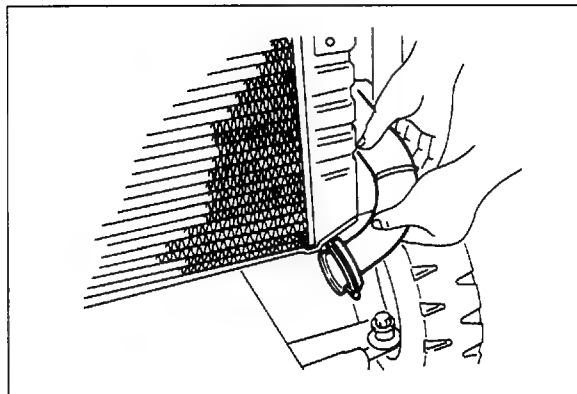
- (1) Disconnect the exhaust pipe flange on the manifold side.



Removing the Flange Set Nuts

LAR27-6

- (3) Remove the exhaust pipe.

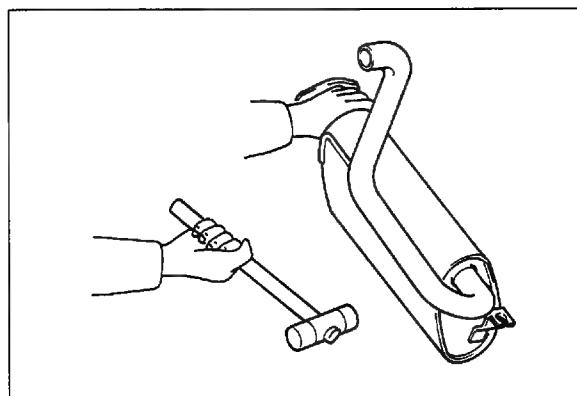


Removing the Exhaust Pipe

LARS40

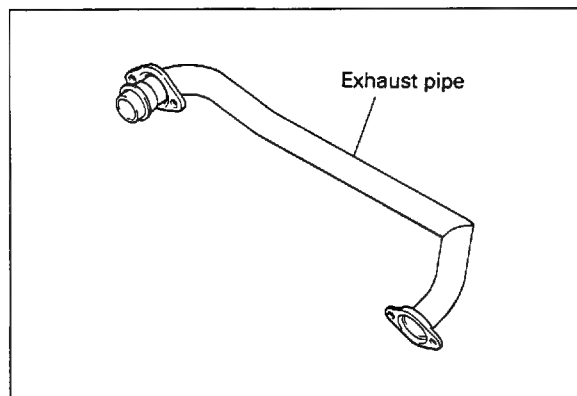
INSPECTION

1. Inspecting the muffler ASSY
 - (1) Tap the muffler lightly with a soft hammer, and inspect corrosion inside the muffler and rust on the outer surface.
 - (2) Check the welded parts of the inlet and tail pipes for cracks.
 - (3) Inspect the muffler mounting rubber every 12 months, and replace it if it is hardened or elasticity is lost.
2. Exhaust pipe inspection
 - (1) Exhaust pipe deformation



Inspecting the Muffler ASSY

LARS41



Inspecting the Exhaust Pipe

LARS42

INSTALLATION

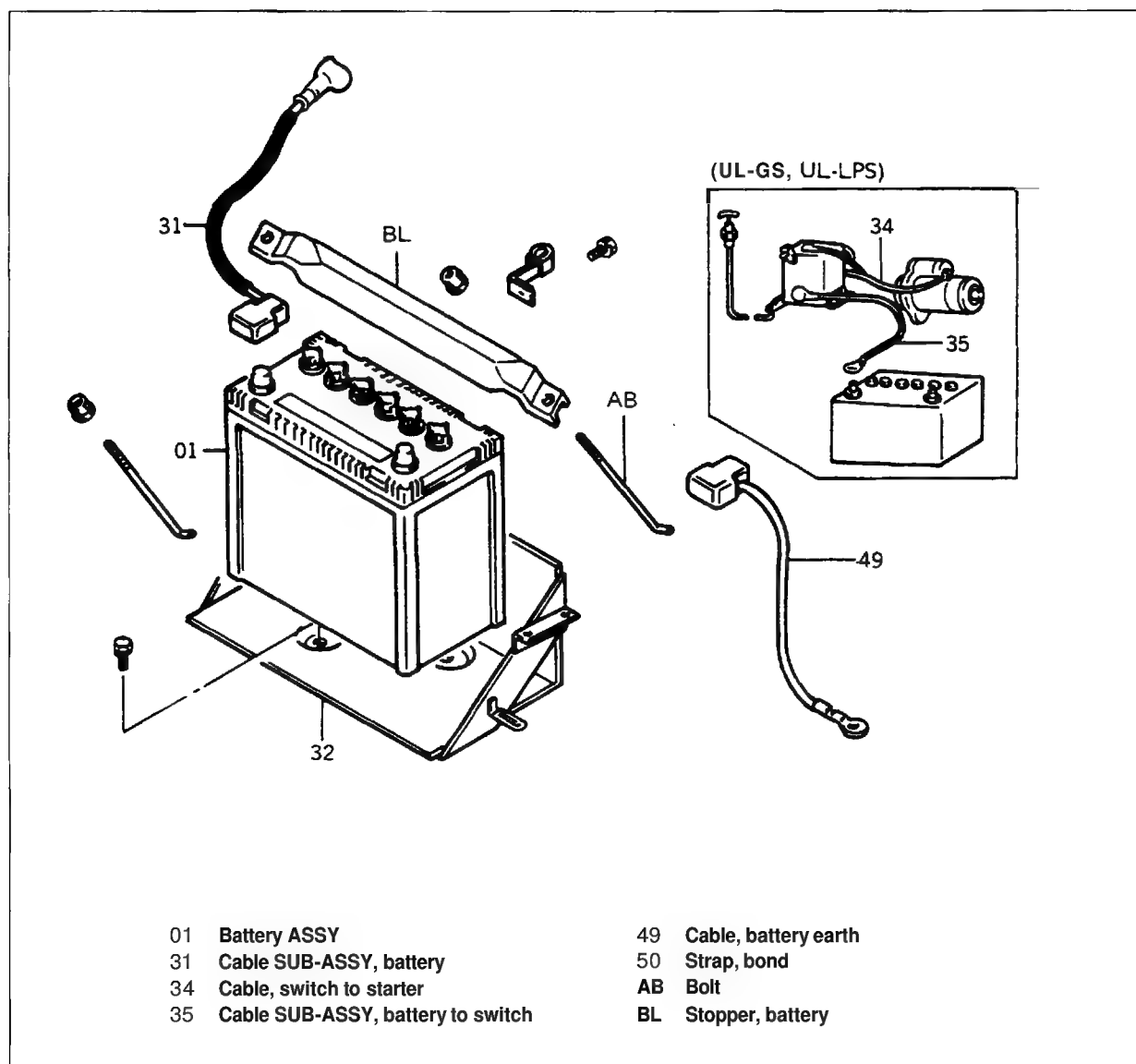
The installation procedure is the reverse of the removal procedure.

Caution:

Replace each gasket with a new one.

BATTERY

COMPONENTS



Battery Components

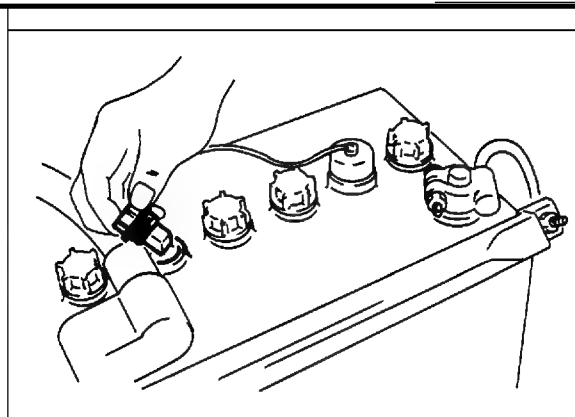
LARM40

SPECIFICATIONS

Item	Installed engine	4Y	4P
Type		NT60	←
Voltage × quantity used	(V)	12	←
5-hour capacity	(Ah)	28	←
Specific gravity of battery fluid in service		1.280 (at 20°C)	←
Battery fluid volume	(ℓ)	2.4	←
Battery weight	(kg)	10.2	←

INSPECTION

1. Battery fluid level
 - (1) Check if the fluid level is between UPPER and LOWER. If insufficient, add distilled water to the UPPER level.



Battery Fluid Level

LARS44

Battery fluid specific gravity inspection

- (1) Use a hydrometer and measure the specific gravity of battery fluid.

Standard: **1.280** (at 20°C)

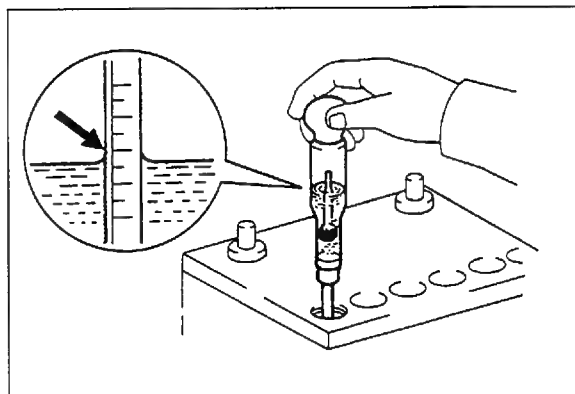
Equation for calculation

$$S_{20} = S_t + 0.0007 (t - 20)$$

S_{20} : Specific gravity at 20°C

S_t : specific gravity measured at t°C

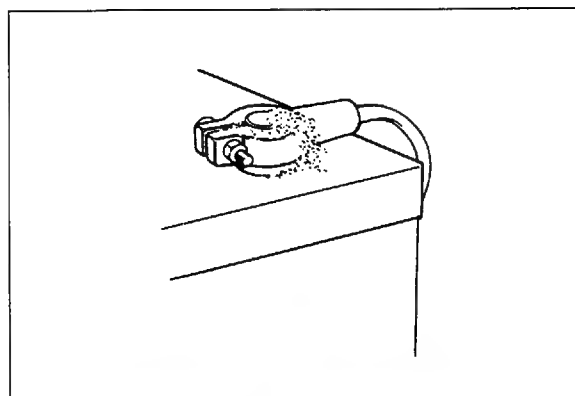
t : Fluid temperature at the time of measurement



Measuring the Battery Fluid Specific Gravity

KAHS106

3. Loosening of battery terminals and harness installation
 - (1) If battery terminals are contaminated to present white color, clean them and apply a thin coat of MP grease on each terminal
4. Loosening of battery terminals and harness installation
 - (1) Retighten the loose terminals and harness connection.



Inspecting the Battery Terminals

LAOS362

REMOVAL

1. Battery terminal disconnection

Caution:

Disconnect the negative terminal first.

2. Battery cover removal
3. Battery removal

INSTALLATION

The installation procedure is the reverse of the removal procedure.

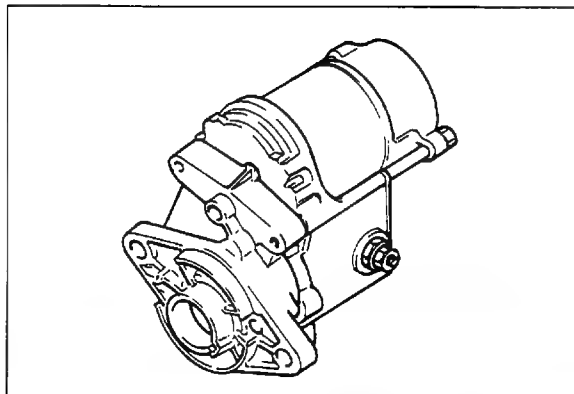


Removing the Battery

LAR26-16

STARTING MOTOR

Refer to the corresponding engine repair manual for details of the starting motor. This manual only describes the removal and installation procedures.



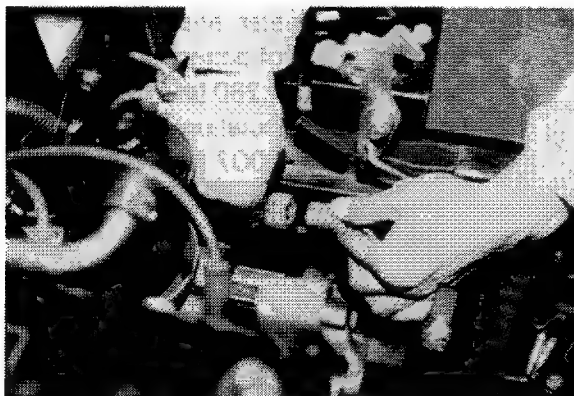
Starting Motor

LAR559

REMOVAL

Battery negative terminal disconnection

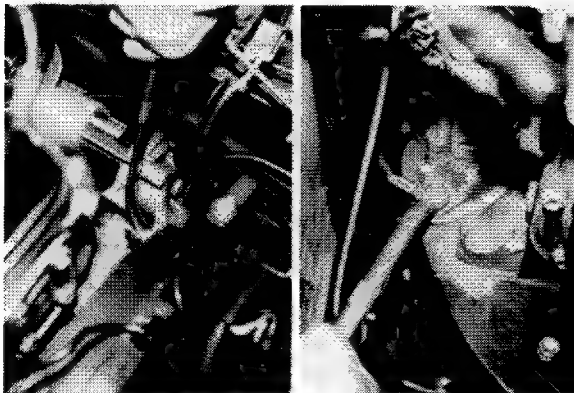
2. Starting motor wiring disconnection
 - (1) Disconnect the starting motor wiring at the connector and terminal.



Disconnect the wiring

LAR40-2

3. Starting motor set bolt removal around it.
For the 4Y engine, remove the engine oil cleaner bracket beforehand.
4. Starting motor removal



Removing the Starting Motor

LAR39-31,36

INSTALLATION

The installation procedures is the reverse of the removal procedure.

Caution:

Check correctness of all electrical connections before connecting the battery negative terminal.

ALTERNATOR

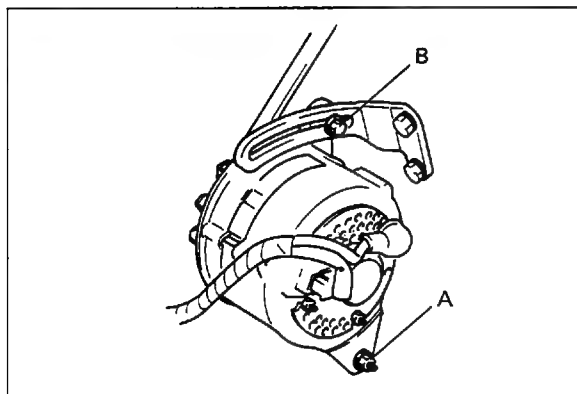


Alternator

LAR39-28

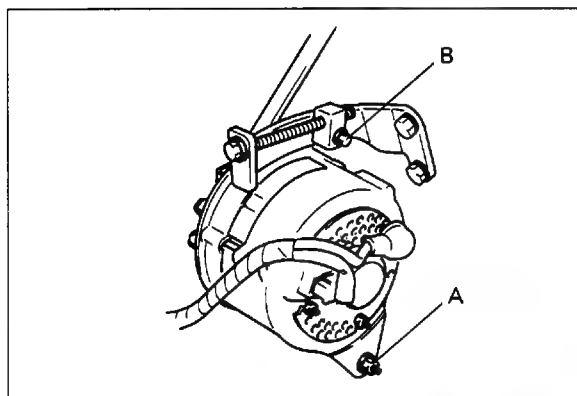
REMOVAL

1. Battery negative terminal disconnection
2. Alternator wiring disconnection
 - (1) Disconnect the alternator wiring at the connector and terminal.
3. Alternator removal
 - (1) Loosen alternator set bolt A and adjusting bolt B.
(Applicable to the 4P engine)
 - (2) Loosen alternator set bolt A and slider set bolt B.
(Applicable to the 4Y engine)



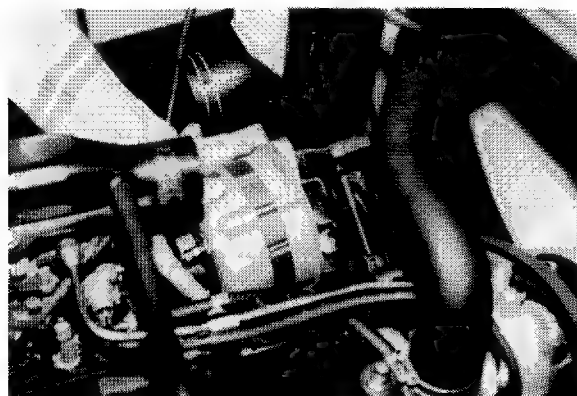
Removing the Alternator (4P engine)

LARS56



Removing the Alternator (4Y engine)

LARS57



Removing the Alternator

LAR39-22

INSTALLATION

The installation procedure is the reverse of the removal procedure.

Caution:

After installing the alternator, adjust the V-belt tension to the standard value.

Standard 4P engine:

8 — 13 mm (0.315 — 0.512 in.)

(when applied with a force of approx. 10 kg (22 lb))

If deviated from the standard, use a lever and move the alternator position for adjustment.

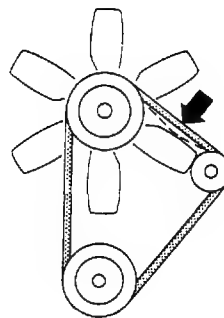
4Y engine:

50 kg (110 lb) (with a tension gauge)

If deviated from the standard, adjust the tightening of the adjusting bolt.

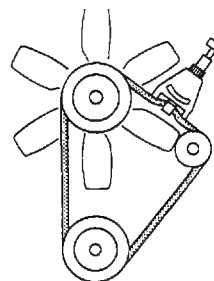
Tensioning the belt: Tighten the bolt.

Slackening the belt: Loosen the bolt.



Measuring the Fan Belt Tension (4P engine)

LAOS365

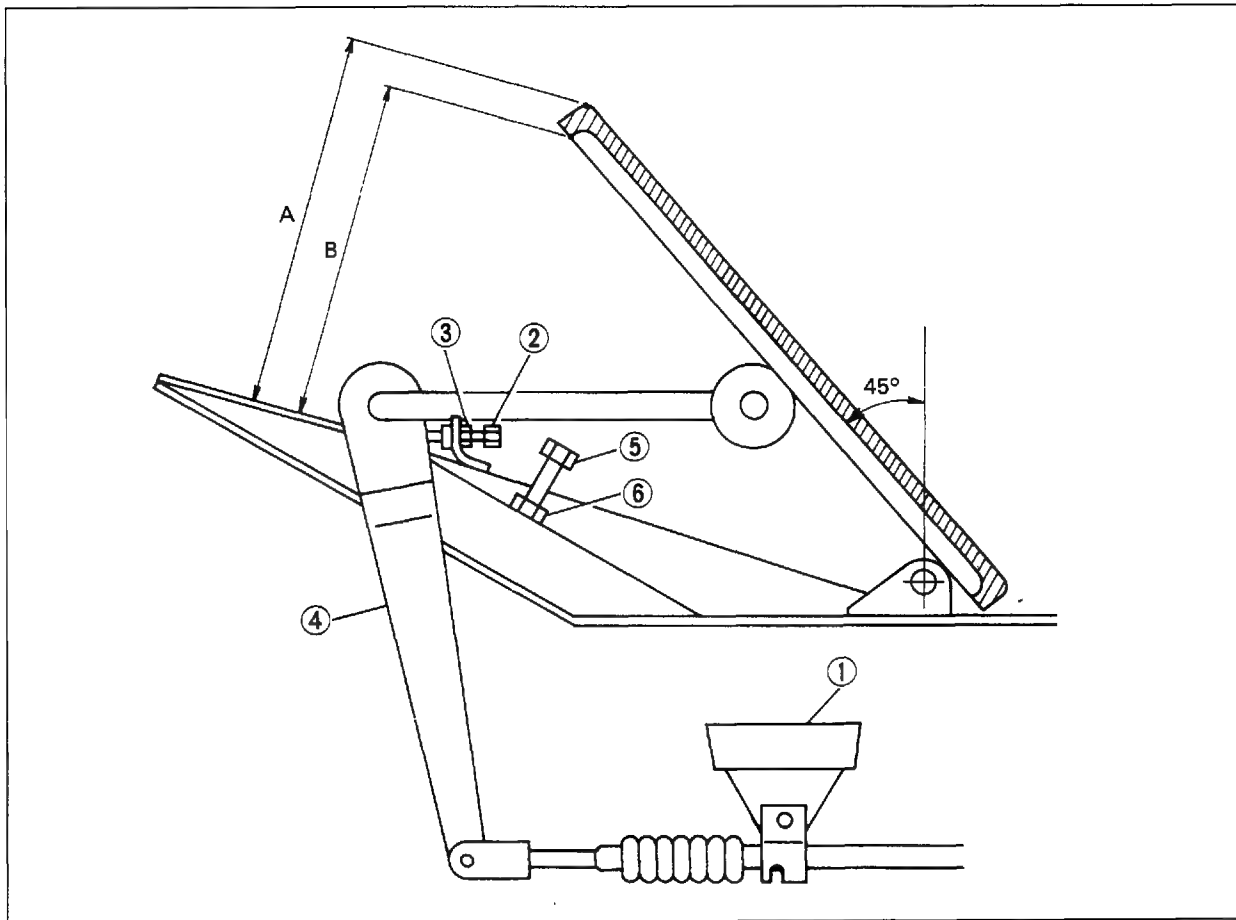


Measuring the Fan Belt Tension (4Y engine)

LAOS367

ACCELERATOR PEDAL

ADJUSTMENT



Accelerator Pedal Adjustment

LAOM209

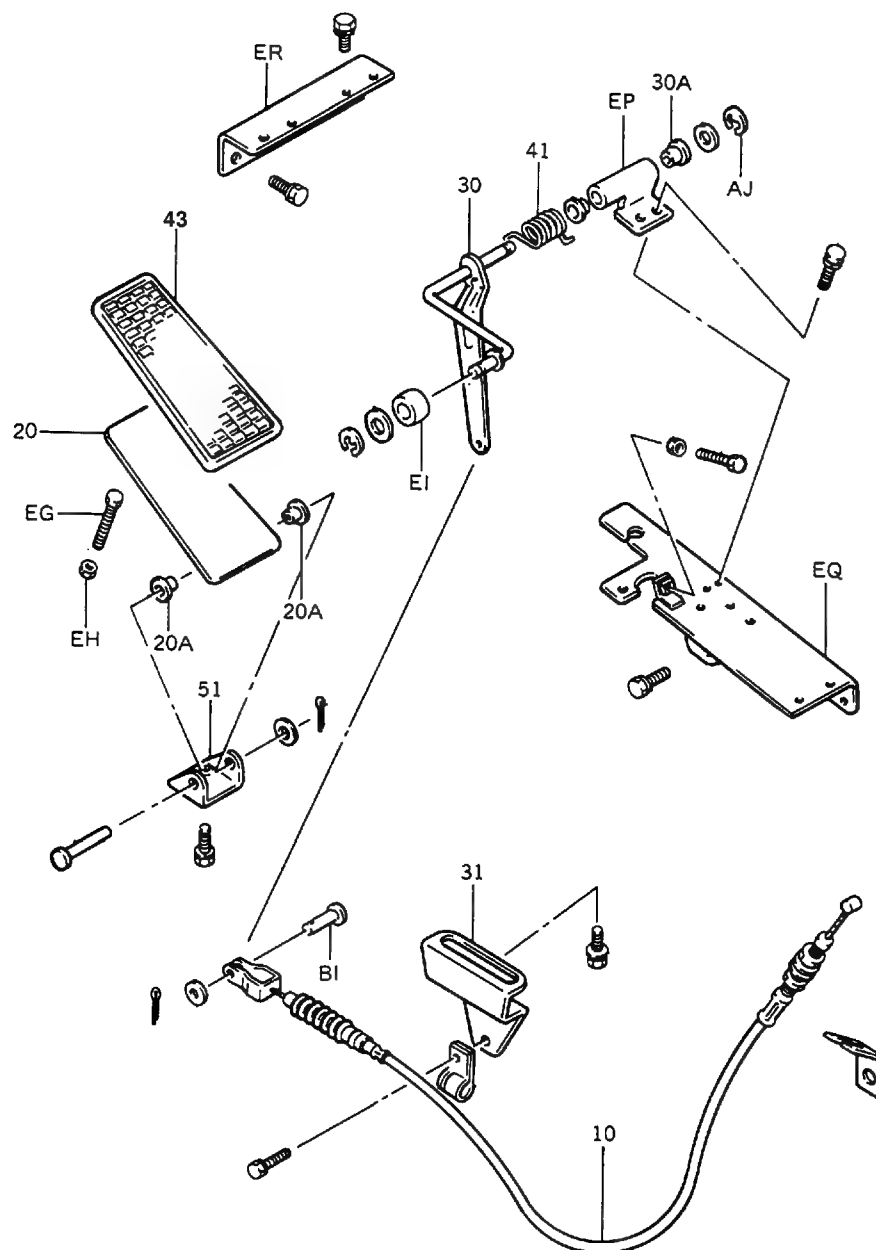
Pedal Height Adjustment

1. Loosen the set bolt of accelerator wire bracket ① to free the accelerator wire.
2. Loosen lock nut ③ for pedal height adjusting bolt ②
3. Measure the height from the side floor to the tip end of the accelerator pedal (with pedal pad).
 Standard accelerator pedal height (A) with pad: 121 mm (4.76 in)
 (B) without pad: 110 mm (4.33 in)
4. If the pedal height does not conform to the above standard, adjust it to the standard dimension by turning the pedal height adjusting screw and then tighten the lock nut.

Pedal Floor Clearance Adjustment

1. Adjust the height of accelerator pedal stopper bolt ⑤ from the floor to the following valve, and surely tighten lock nut ⑥.
Pedal floor clearance 40 mm (1.57 in)

COMPONENTS



- 10 Wire ASSY, accelerator flexible
- 20 Pedal SUB-ASSY, accelerator
- 20A Bushing
- 30 Arm SUB-ASSY, accelerator link, No. 1
- 30A Bushing
- 31 Bracket SUB-ASSY, accelerator wire, No. 1
- 41 Spring, torsion, No. 1
- 43 Pad, pedal
- 51 Bracket, pedal

- AJ Ring, E
- BI Pin, w/hole
- EG Bolt
- EH Nut
- EI Roller
- EP Bracket, accelerator arm
- EQ Bracket SUB-ASSY, accelerator
- ER Bracket SUB-ASSY, accelerator

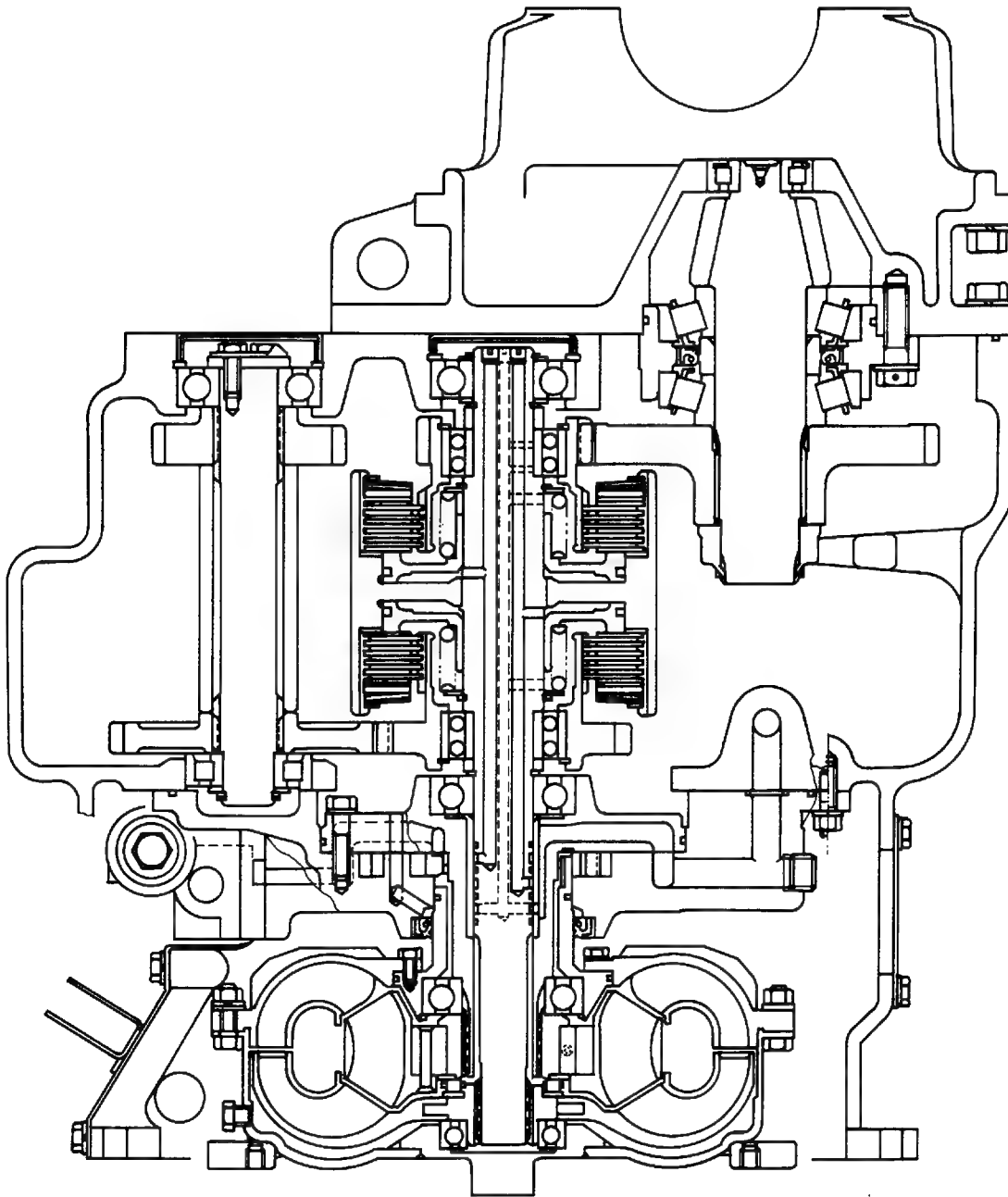
Accelerator Components

LARM41

TORQUE CONVERTER

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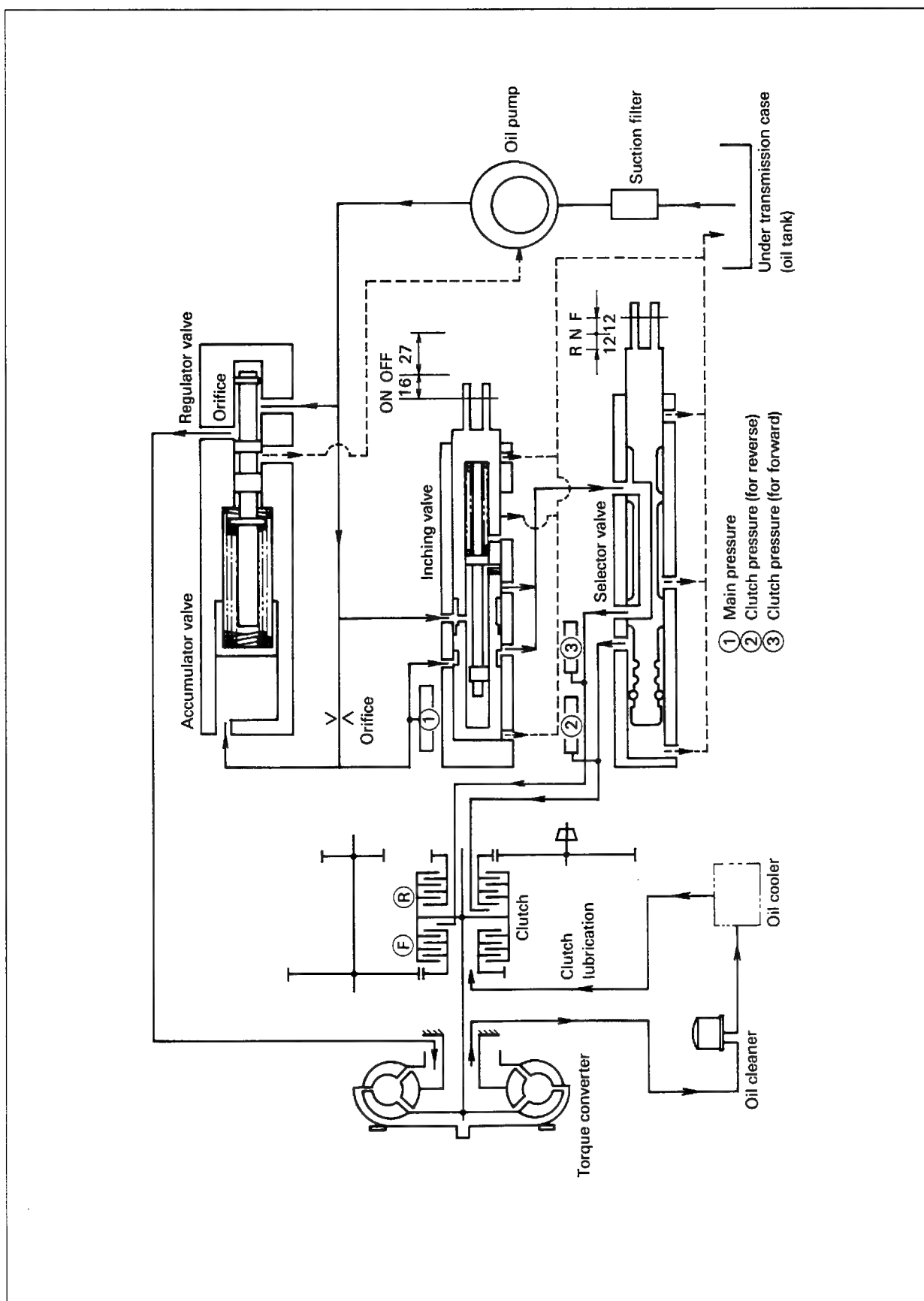
GENERAL



Torque Converter Sectional View

LARL1

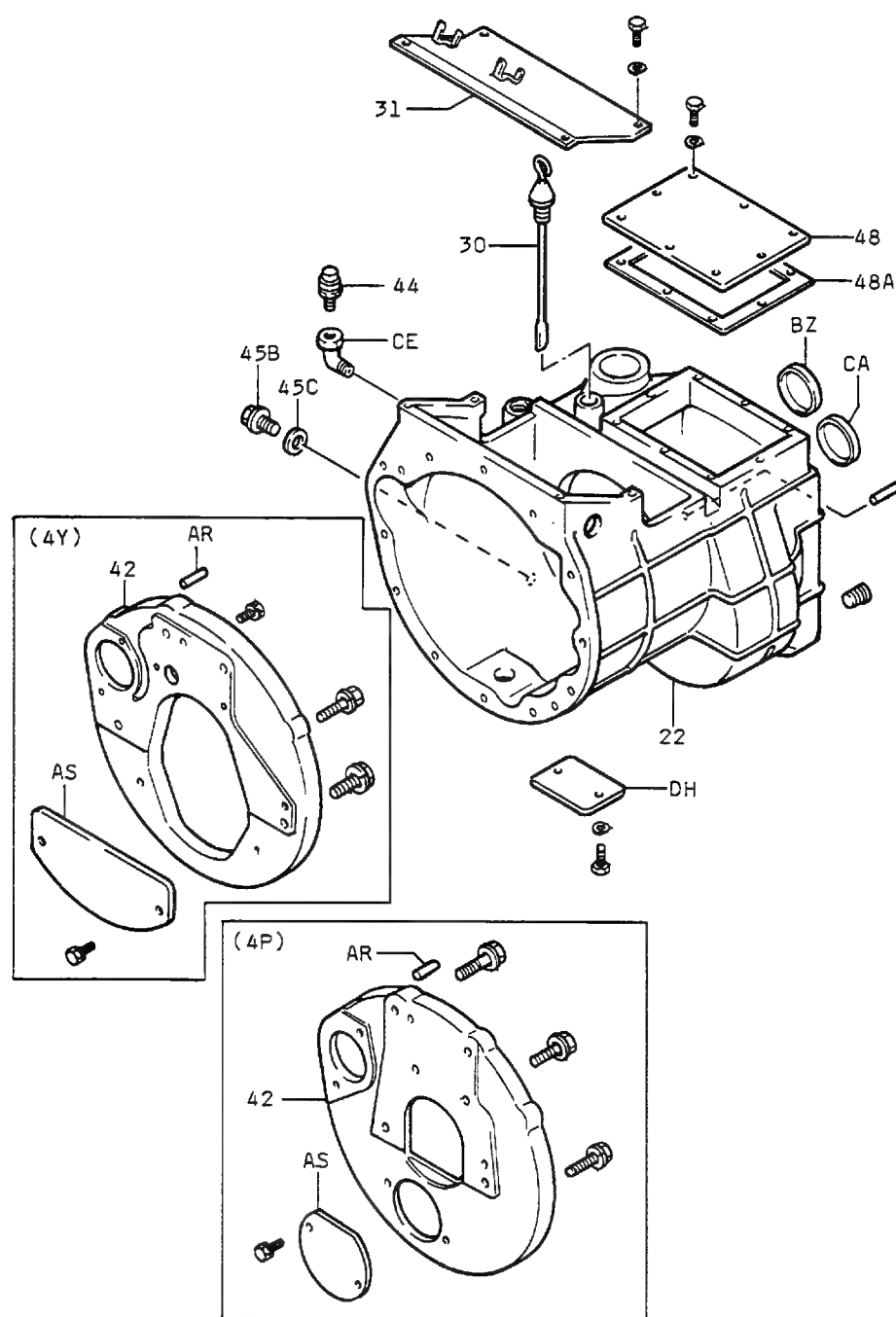
HYDRAULIC CIRCUIT DIAGRAM



Hydraulic Circuit Diagram

LARM4

COMPONENTS

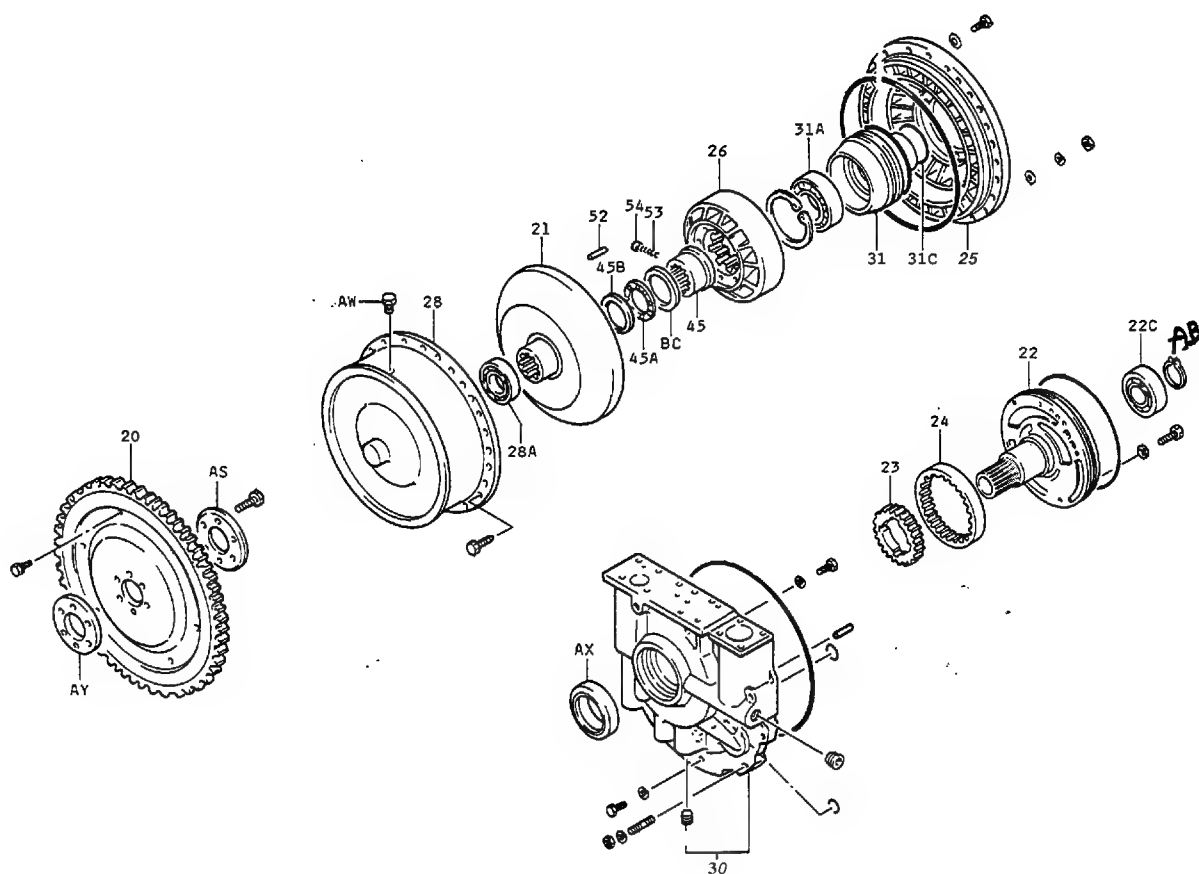


- 22 Case SUB-ASSY, transmission
- 30 Gage SUB-ASSY, oil level
- 31 Cover SUB-ASSY, upper
- 42 Plate, torque converter end
- 44 Breather, air
- 45B Plug, drain
- 45C Gasket
- 48 Cover, transmission case

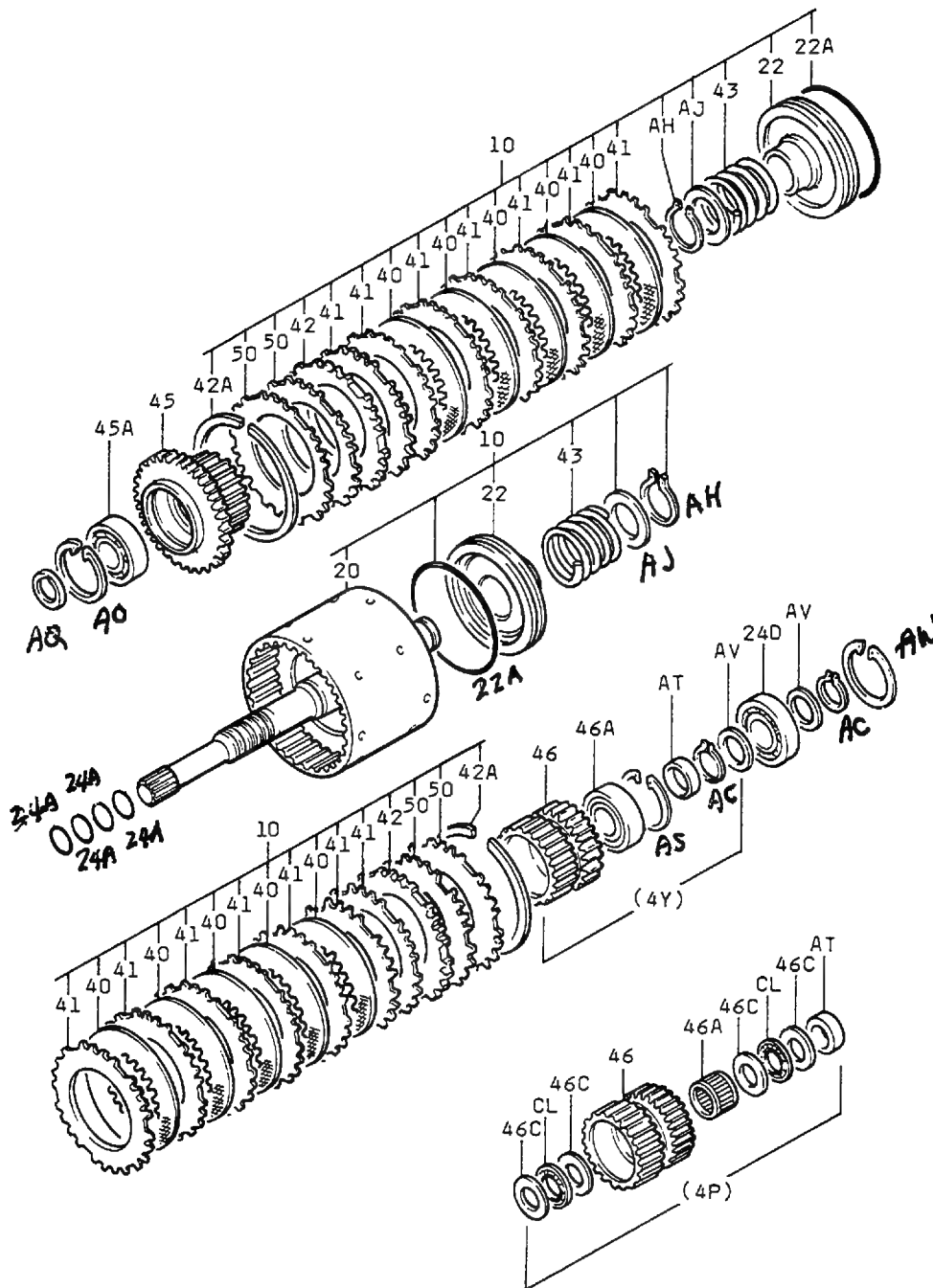
- 48A Packing, cover
- AR Pin, straight
- AS Plate, cover
- BZ Plate, seal
- CA Plate, seal
- CE Elbow
- DH Cover

Transmission Case Components

LARM42



- | | | | |
|-----|--|-----|-----------------------|
| 20 | Gear SUB-ASSY, drive plate & ring | 31C | Ring, seal |
| 21 | Runner SUB-ASSY, turbine | 45 | Hub (race, inner) |
| 22 | Shaft SUB-ASSY, stator | 45A | Bearing, thrust |
| 22C | Bearing | 45B | Washer, thrust, No. 1 |
| 23 | Gear SUB-ASSY, oil pump drive | 52 | Roller |
| 24 | Gear SUB-ASSY, oil pump driven | 53 | Spring |
| 25 | Impeller SUB-ASSY, pump | 54 | Cap, spring |
| 26 | Stator SUB-ASSY | AS | Spacer, drive plate |
| 28 | Cover SUB-ASSY, drive (disc SUB-ASSY) | AW | Plug, taper |
| 28A | Bearing (for drive cover) | AX | Seal, oil |
| 30 | Case, SUB-ASSY, oil pump | AY | Spacer |
| 31 | Extension SUB-ASSY, pump impeller (boss) | BC | Washer, thrust |
| 31A | Bearing, pump impeller extension | | |



- 10 Drum ASSY, clutch, No. 1
- 20 Drum SUB-ASSY, clutch, No. 1
- 22 Piston SUB-ASSY, clutch, No. 1
- 22A Ring, piston
- 24D Bearing, No. 1
- 40 Disc, clutch
- 41 Plate, clutch
- 42 Plate, clutch pressure
- 42A Ring, hole snap
- 43 Spring, clutch return
- 45 Gear, clutch (forward)

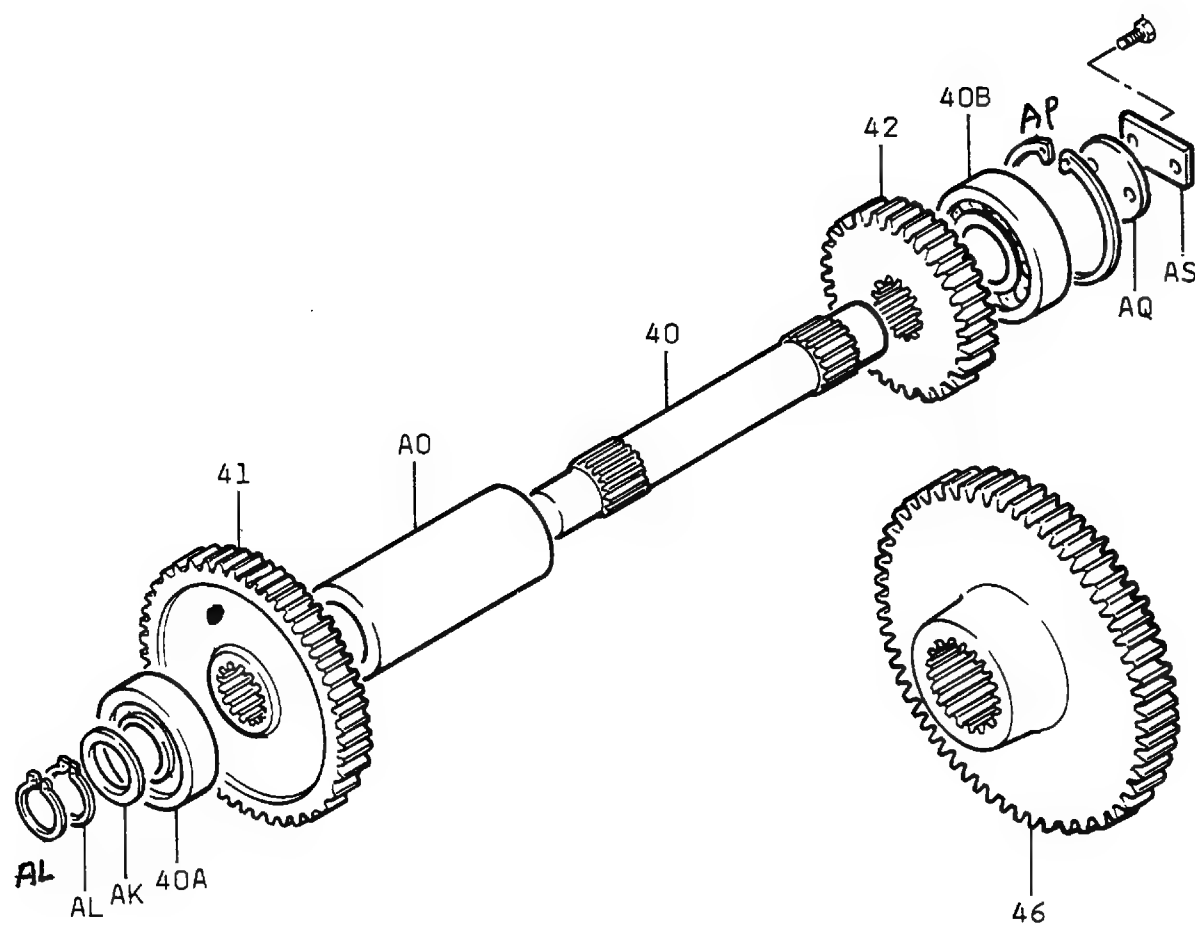
24A SEAL RING - 4EA.

- 45A Bearing
- 46 Gear, clutch (reverse)
- 46A Bearing
- 46C Washer, thrust, No. 1
- 50 Plate, clutch camber
- AH Ring, shaft snap - 2 EA
- AJ Retainer, spring - 2 EA
- AT Spacer
- AV Spacer - 2 EA
- CL Bearing, thrust

AQ SPACER
AO SNAPRING

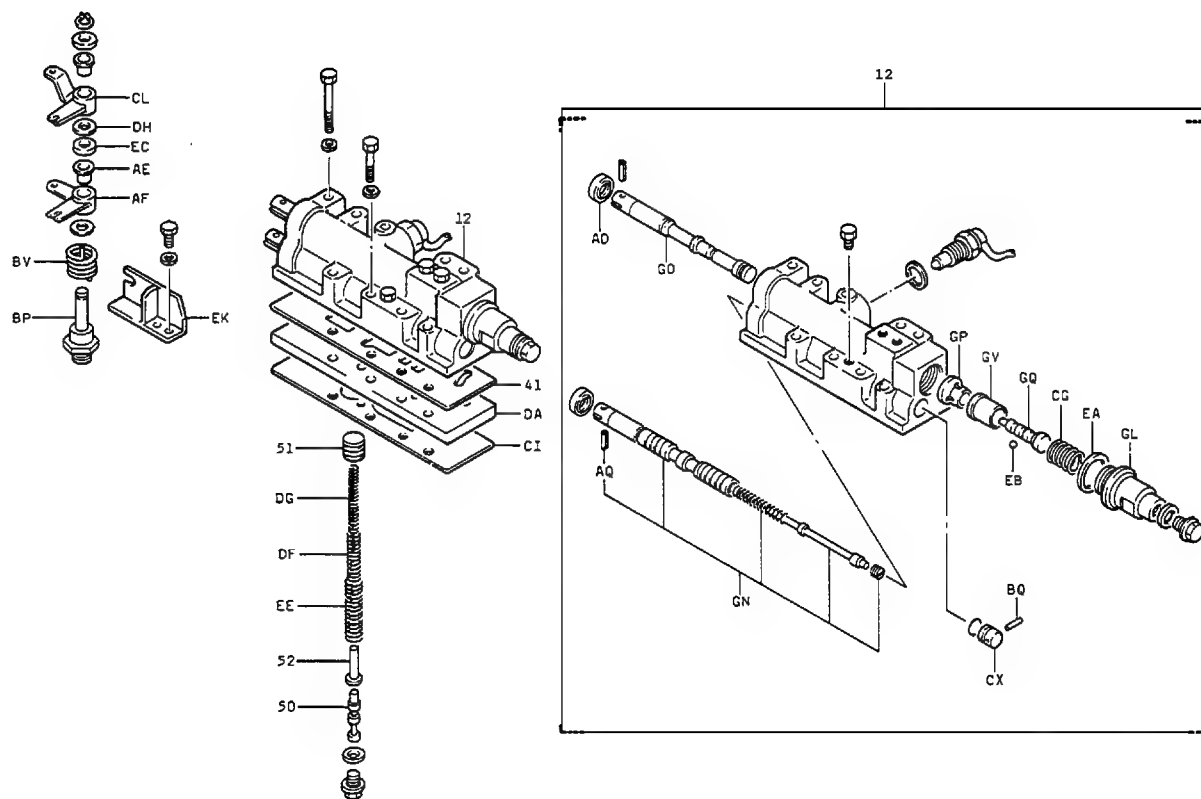
Torque Converter Clutch Components

LARM44



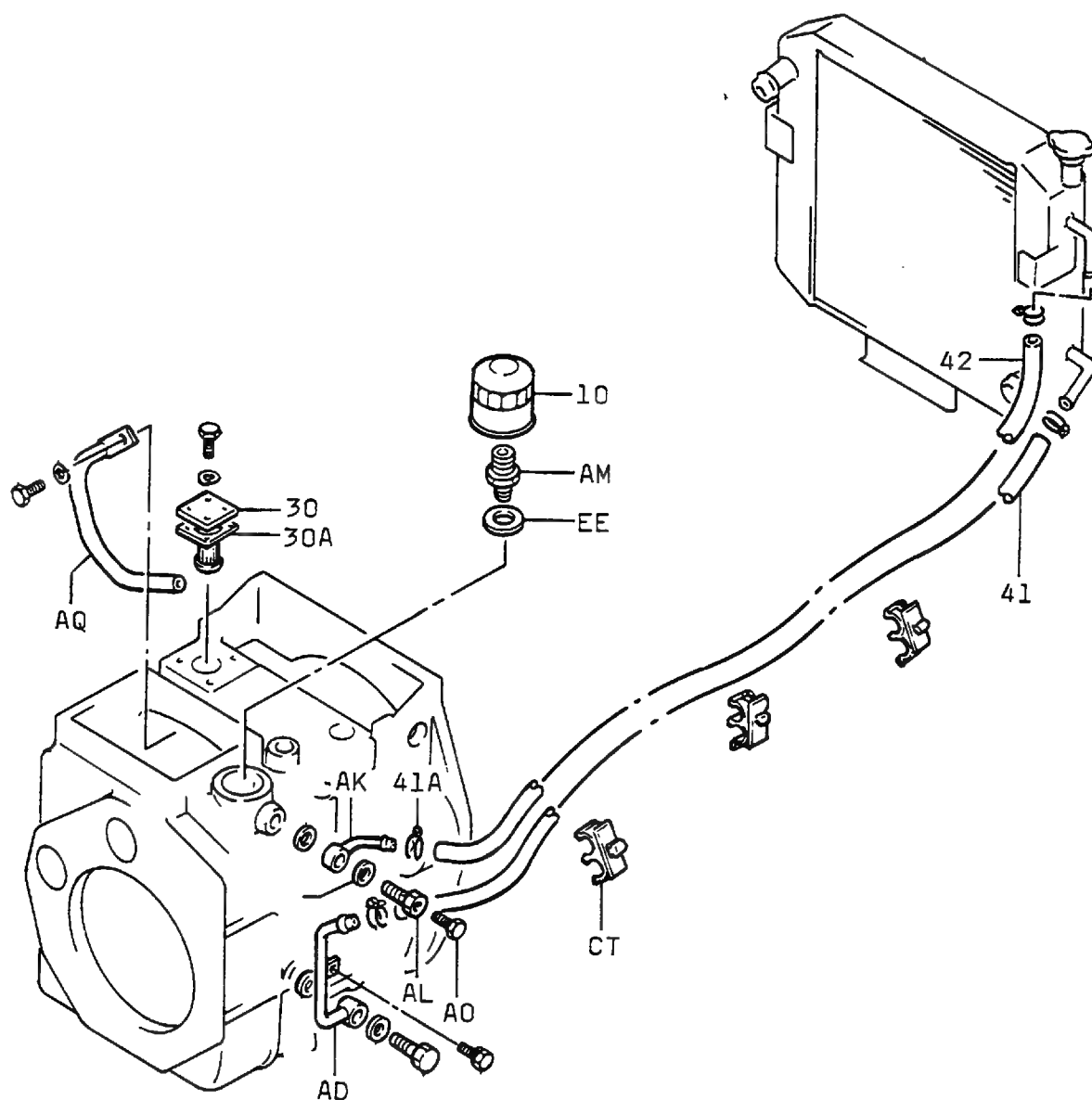
40 Shaft, counter
 40A Bearing, No. 1
 40B Bearing, No. 2
 41 Gear, counter, No. 1
 42 Gear, counter No. 2
 46 Gear, output, No. 1

AK Spacer
 AL Ring, snap (2)
 AO Spacer
 AQ Plate, lock
 AS Washer, lock
 AP SNAP RING



12 Valve ASSY, control
 41 Packing, control valve body
 50 Valve, regulator
 51 Piston, accumulator
 52 Retainer, spring
 AD Seal, oil
 AE Bushing
 AF Lever, inching
 AO Pin, spring
 BP Shaft, select lever
 BV Spring, return
 CG Spring
 CI Packing
 CL Lever, selector
 CX Plug

DA Plate, SUB
 DF Spring, regulator, outer
 DG Spring, regulator, inner
 DH Washer, thrust
 EA Washer, seal
 EB Ball, lock (3)
 EC Spacer
 EE Spring, accumulator
 EK Bracket SUB-ASSY, inching wire
 GL Cover, detent
 GN Spool SUB-ASSY, inching
 GO Spool SUB-ASSY, selector
 GP Retainer, detent
 GV Sleeve, detent



- 10 Filter ASSY, oil
- 30 Strainer SUB-ASSY, oil
- 30A Packing, oil strainer body
- 41 Hose, low pressure, No. 1
- 41A Clamp, No. 1
- 42 Hose, low pressure, No. 2
- AD Union

- AK Union
- AL Bolt, union
- AM Nipple
- AO Bolt
- AQ Pipe ASSY
- CT Clamp
- EE Gasket

Torque Converter Piping Components

LARM47

SPECIFICATION

Item	Vehicle	5FGC10 5FGC15 5FGC13	30-5FGC10 30-5FGC15 30-5FGC13
Manufactur		Okamura Mfg. Co., Ltd.	←
Torque converter type		3-element, single stage, 2 phase	←
Torque converter designation		MD14	M14
Stall torque ratio		2.8	3.1
Stall speed	rpm	1850	2050
No-load maximum governed speed	rpm	2450	2900
Speed gear ratio			
Forward		2.144	2.377
Reverse		2.111	2.360
Speed selection system		Hydraulic pressure	←
* Modulating control pressure	kg/cm ² (psi)	8 — 12 (113.6 ~ 170.4)	←
* Clutch actuating pressure (Main pressure)	kg/cm ² (psi)	8 — 12 (113.6 ~ 170.4)	←
* Converter internal pressure (Outlet pressure)	kg/cm ² (psi)	0.5 ~ 3.5 (7.1 ~ 49.7)	←
Oil capacity	ℓ (USgal)	9.5 (2.5)	←
Oil type		GM Dexron ®II	←
Engine combination		4Y engine	4P engine

Asterisked (*) items are measured under the following conditions:

1. Torque converter oil temperature at 50 to 80°C
2. Engine speed at the no-load static maximum speed

TROUBLESHOOTING

Trouble status	Inspection method	Judgment, estimated cause and remedial action
1. The vehicle does not move at all or moves very slowly. [The clutch does not transmit the power.]	1.1 Check the main pressure. Standard: 8 — 12 kg/cm ² at the maximum speed. Check for each of forward, reverse and neutral shift positions.	<ul style="list-style-type: none"> ● Oil level check → Check with the level gauge.
	1.1.a The oil pressure is much lower than the standard for each of forward, reverse and neutral shift positions.	<ul style="list-style-type: none"> ● Regulator valve sticking → Check trapping of foreign matters and clean. ● Broken regulator valve spring → Replacement ● Inching spool position error → Inching link mechanism check → Adjustment ● Oil pump malfunction <ul style="list-style-type: none"> (1) Defective oil pump → Replacement (2) Extension sleeve → Damage → Replacement ● Suction system defect <ul style="list-style-type: none"> (1) Clogged suction filter → Replacement (2) Air suction → Inspection of O-ring or gasket at each point ● Clogging or oil leakage in the oil line from the pump to the control valve → Oil line check → O-ring or gasket replacement
	1.1.b The oil pressure is abnormally high.	<ul style="list-style-type: none"> ● Clogged regulator valve orifice → Valve inspection and washing
	1.1.c The oil pressure is lower than the standard during either forward or reverse traveling.	→ Proceed to item 1.2.
	1.2 Check the clutch oil pressure. Standard: 8 kg/cm ² or more at maximum speed <ul style="list-style-type: none"> ● The clutch oil pressure is slightly lower than the main pressure. 	

Trouble status	Inspection method	Judgment, estimated cause and remedial action
	1.2.a The clutch oil pressure is lower than the standard during either forward or reverse traveling. (Inspect the hydraulic system and parts next to the abnormal point.)	<ul style="list-style-type: none"> ● Oil leakage between selector valve and servo case → Oil line check → O-ring or gasket inspection ● Selector valve position error — Adjustment or replacement ● Worn or broken seal ring (clutch shaft) → Replacement Damaged clutch piston, damaged piston ring, piston disconnection, etc. → Clutch overhaul
	1.2.b The clutch pressure is low during both forward and reverse traveling. (Check the oil line between the regulator valve and selector valve.)	<ul style="list-style-type: none"> ● Clogged variable orifice → Disassembly and washing ● Accumulator piston sticking → Repair or replacement ● Inching valve position error — Inching link mechanism inspection → Adjustment
	1.3 Both the main pressure and clutch oil pressure are normal.	<ul style="list-style-type: none"> ● Clogged oil line between selector valve and clutch piston → Oil line check and clogging substance removal ● Clutch piston sticking
	1.3.a Other mechanical trouble inside the transmission & differential (In most cases the torque converter oil temperature rises excessively and noise is generated.)	→ Torque converter overhaul
2. Insufficient gradeability and drawbar pull (insufficient power) [The torque converter fails to generate the required torque.]	2.1 Inspection of no-load static maximum speed and loaded maximum speed of engine	2.1.a If the speed is outside the standard range, adjust the engine according to the engine tune-up section.

Trouble status	Inspection method	Judgment, estimated cause and remedial action
	Step 1. Inspection of no-load static maximum engine speed according to the measurement 6 test section.	
	Step 2. Inspection of loaded maximum engine speed. After the maximum speed inspection in step 1, operate the tilt lever to the forward or backward tilt position to provide the relief state and measure the maximum speed at full acceleration. ● In the case of the gasoline engine, the speed is decreased by 150 to 300 rpm from the no-load static maximum speed.	2.1.b When the speed reduction is greater than the standard (insufficient output): ● Readjust the air governor by referring to the engine tune-up section. ● Check if the carburetor throttle valve is fully opened when the accelerator pedal is fully depressed. ● Since the output is generally greater in the LPG engine than in the gasoline engine, adjust the regulator governor sufficiently.
		2.1.c If the engine speed and output are normal, proceed to item 2.2.
	2.2 Main pressure and clutch pressure inspection Main pressure standard: 8 — 12 kg/cm ² at maximum speed Clutch pressure standard: 8 kg/cm ² more at maximum speed	2.2.a If the main pressure or clutch pressure is abnormal, inspect according to 1.1 and 1.2 above.
	2.3 Stall speed inspection ● Carry out the stall test and measure the engine speed at the time. (Note) Always inspect the engine output (loaded maximum speed), main pressure and clutch pressure to check that the engine and clutch systems are normal before inspecting the stall speed.	[Judge whether the converter side (stator) or the clutch side is defective by inspecting the stall speed.]

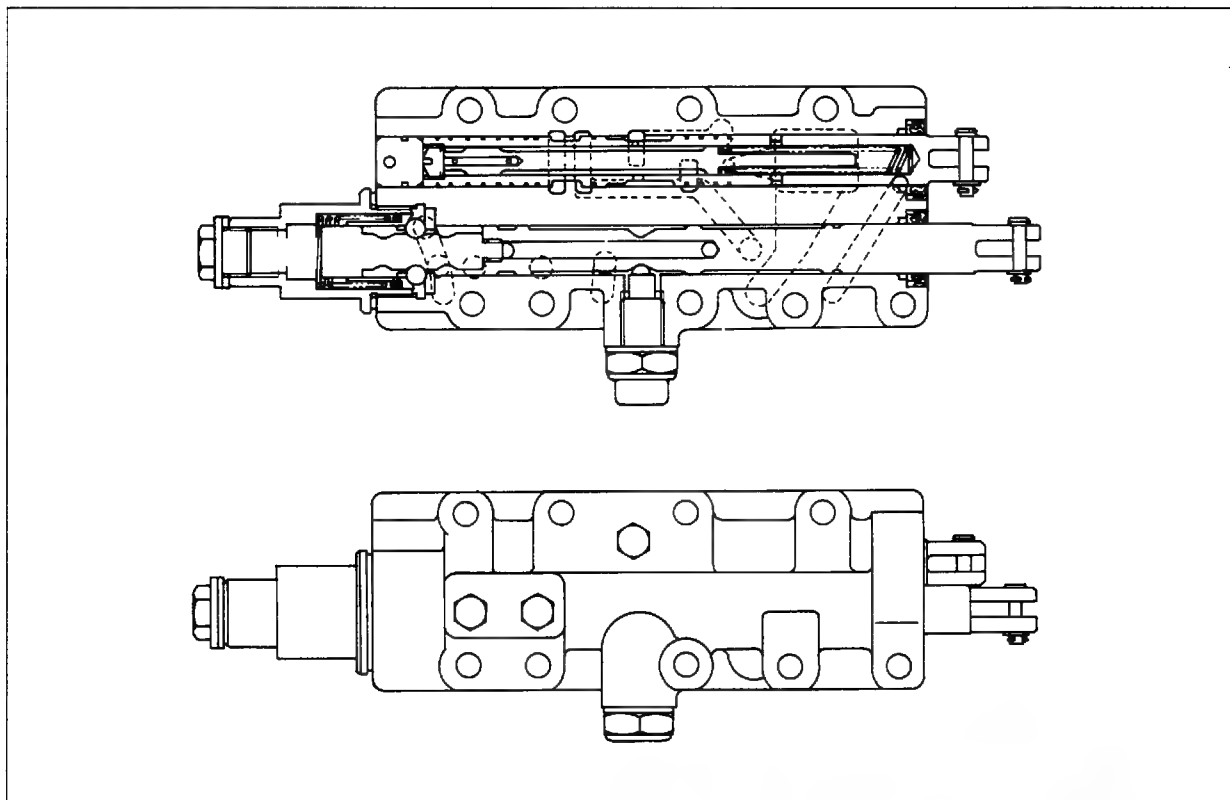
Trouble status	Inspection method	Judgment, estimated cause and remedial action
	Stall speed 4P engine: around 2050 rpm 4Y engine: around 1850 rpm (Note) The stall speed may vary by 100 rpm upward or downward from the above standard value depending on slight deviations of the individual engine and torque converter performances as well as individual matching. The above value, therefore, should be used as the guideline for defect judgment.	2.3.a The stall speed is too low. (Decreased by 300 rpm or more.) ● The one-way clutch of the stator is slipping. → Stator disassembly, inspection and replacement
		2.3.b The stall speed is too high. ■ The clutch slips excessively. → Clutch system inspection and replacement
3. The vehicle does not travel in the forward or reverse direction.	3.1 Inspect the vehicle traveling direction in the neutral shift position. 3.2 Inspect the clutch pressure on the defective side. 3.3 Inspect the selector valve. 3.4 Inspect the main shaft seal ring.	● If the vehicle travels → Clutch seizure → Clutch disassembly or replacement ● If the vehicle does not travel → Proceed to item 3.2. ● When the clutch pressure is normal → Clutch slipping or clutch pin sliding motion defect → Clutch disassembly or replacement ● When the clutch pressure is abnormal → Proceed to item 3.3. ● Selector valve defective → Repair or replacement ● Selector valve normal → Proceed to item 3.4. ● Seal ring defective → Replacement ● Seal ring normal → Clutch disassembly because of defective clutch system
4. Large starting time lag	4.1 Judge the starting time lag by depressing the accelerator pedal simultaneously with shifting. (Comparison with a normal vehicle, if available, is desirable.)	

Trouble status	Inspection method	Judgment, estimated cause and remedial action
	4.2 Inspect the main and clutch pressures. At the same time, inspect the clutch pressure rise characteristic.	4.2.a The main or clutch pressure is abnormal. See items 1.1 and 1.2 above.
	Main pressure standard: 8 — 12 kg/cm ² at maximum speed Clutch pressure standard: 8 kg/cm ² or more at maximum speed	4.2.b When the clutch pressure rise characteristic is abnormal (too slow): <ul style="list-style-type: none"> ● Accumulator spring damage or fatigue → Disassembly, inspection and replacement ● Clogged variable orifice → Disassembly, inspection and washing ● Inching spool returning defect → Link mechanism inspection and adjustment ● Clogged inching orifice → Disassembly, inspection and washing
	4.3 Oil inspection	4.3.a Inefficient oil level, suction filter clogging and air suction → Addition, disassembly and cleaning
5. Generation of inching defect jerk (shock)	5.1 Inching lever operation inspection Visually inspect the inching lever movement.	5.1.a Inching lever operation defect → Link mechanism disassembly, inspection and adjustment
	5.2 Main pressure and clutch pressure inspection Operation the inching pedal and inspect the clutch pressure variation. Main pressure standard: 8 — 12 kg/cm ² at maximum speed Clutch pressure standard: 8 kg/cm ² or more at maximum speed	5.2.a When the clutch pressure rise is abnormal: <ul style="list-style-type: none"> ● Clogged inching orifice → Control valve body orifice washing ● Accumulator spring damage or fatigue → Disassembly, inspection and replacement ● Clogged variable orifice → Disassembly, inspection and washing ● Inching spool operation defect → Disassembly, inspection and washing

Trouble status	Inspection method	Judgment, estimated cause and remedial action
		5.2.b When the clutch pressure rise characteristic is normal (inspect the clutch pack) <ul style="list-style-type: none"> ● Clutch return spring damage and fatigue → Disassembly and replacement ● Clutch piston operation defect → Disassembly, inspection, correction or replacement ● Abnormal clutch plate wear → Disassembly and replacement
6. Overheat	6.1 Torque converter oil inspection Inspect the oil quantity and quality.	6.1.a Torque converter oil defect or improper oil quantity <ul style="list-style-type: none"> ● Improper oil quantity → Check if the oil quantity is excessive or insufficient, and correct the quantity. ● Air suction → O-ring inspection at each joint ● Water mixture in oil → Oil replacement
	6.2 Inspection of main pressure, clutch pressure and torque converter pressure (outlet pressure) Main pressure standard: 8 — 12 kg/cm ² at maximum speed Clutch pressure standard: 8 kg/cm ² or more at maximum speed Torque converter pressure standard: 0.5 — 3.5 kg/cm ² at maximum speed	6.2.a The main pressure or clutch pressure is lower than the standard. (Inspect according to items 1.1 and 1.2 above.)
		6.2.b The torque converter pressure is lower than the standard. <ul style="list-style-type: none"> ● Clogged regulator valve orifice → Disassembly, inspection and washing ● Large resistance of internal oil piping → Inspection of internal oil piping for clogging ● Clogged suction filter → Disassembly, inspection and replacement
	6.3 Clutch inspection Set to the neutral shift position and check if the vehicle travels.	6.3.a The vehicle travels in the forward or reverse direction even though the shift lever is at the neutral position. <ul style="list-style-type: none"> ● Clutch seizure or clutch pack damage → Disassembly, inspection and replacement
	6.4 Torque converter inspection	6.4.a Converter defect <ul style="list-style-type: none"> ● Stator sticking → Stator disassembly, inspection and replacement ● Impeller contact → Judgment according to the oil filter check, and replacement if defective

Trouble status	Inspection method	Judgment, estimated cause and remedial action
		<ul style="list-style-type: none"> ● Reduced circulation flow → Clogged internal oil path → Inspection and washing
	6.5 Transmission inspection	6.5 a Transmission defect <ul style="list-style-type: none"> ● Clutch dragging → Disassembly, inspection and replacement ● Bearing wear or seizure → Disassembly, inspection, correction or replacement
	6.6 User's operation status check	6.6.a Inspect the operation status, use status and operating place at the user. <ul style="list-style-type: none"> ● Carry out inching operation and check any forced motion.
	6.7 Clogged radiator check	<ul style="list-style-type: none"> ● Inspection and cleaning
7. Noise is generated.	7.1 Torque converter inspection	<ul style="list-style-type: none"> ● Drive plate damage → Replacement ● Bearing damage → Replacement ● Impeller contact → Correction or replacement (Check any fragments in the oil filter.) ● Loosened bolts → Retightening ● Gear pump damage → Correction or replacement
	7.2 Transmission inspection	<ul style="list-style-type: none"> ● Dragging noise by clutch seizure → Inspection and replacement ● Bearing wear and damage → Inspection and replacement ● Gear damage → Replacement ● Spline wear → Replacement
8. Oil leak (general)	8.1 Oil seal inspection	Inspect each seal lip and the sliding contact surface for damage or wear, and replace any defective item. Bolt retightening and O-ring or packing replacement <ul style="list-style-type: none"> ■ Correction or replacement ● Overheat ● Excessive oil
	8.2 Case joint inspection	
	8.3 Blowhole and crack inspection	
	8.4 Oil spouting from air breather	

CONTROL VALVE

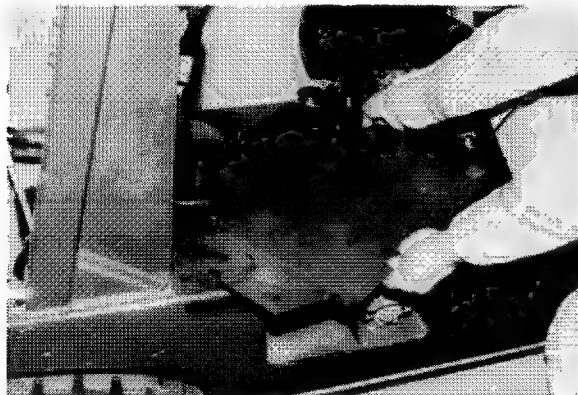


Control Valve Sectional View

LAR26-3

REMOVAL

1. Remove the toe board
 - (1) Engine hood opening
 - (2) Toe board



Removing the Toe Board

LAR26-3

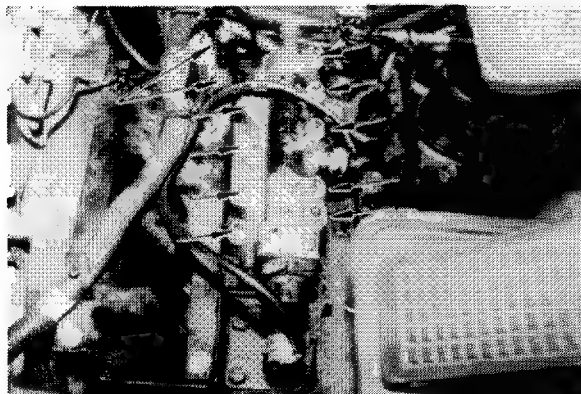
2. Disconnect the inching wire and control lever.
 - (1) Control lever disconnection
 - (2) Inching wire disconnection



Disconnecting the Wire and Lever

LAR27-17,18

3. Remove the control valve
 - (1) Wiring
 - (2) Set bolt
 - (3) Control valve

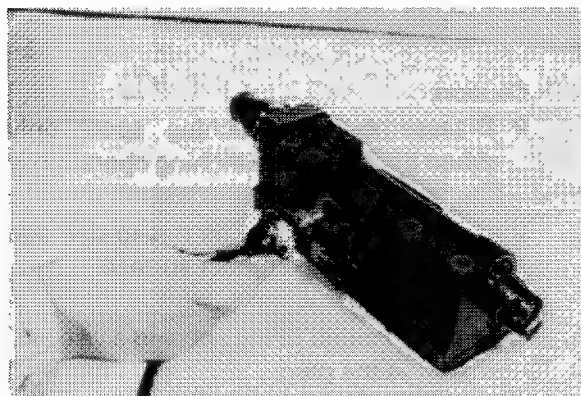


Removing the Control Valve

LAR40-4

DISASSEMBLY

1. Remove the back switch.



Removing the Back Switch

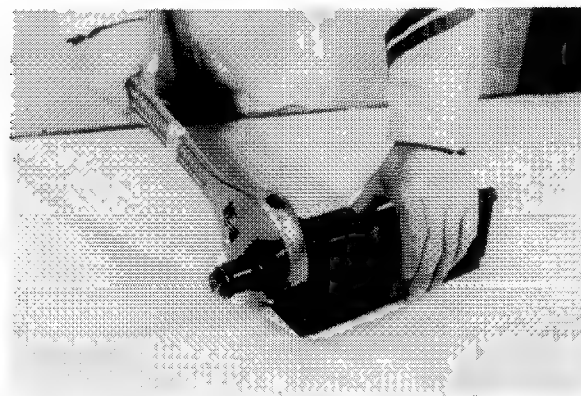
LAR10-13

2. Remove the selector spool.
 - (1) Detent cover

Caution:

Carefully operate because the spring may fly out when the detent cover is removed.

- (2) Seal washer
- (3) Spring



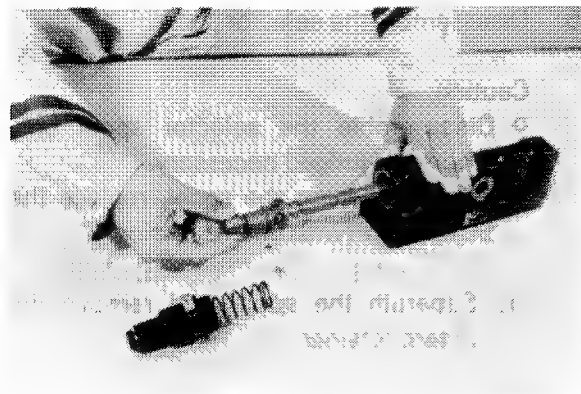
Removing the Detent Cover

LAR10-15

- (4) Selector spool w/detent sleeve

Caution:

The lock ball falls when the spool is extracted. Carefully operate to prevent it from being lost.

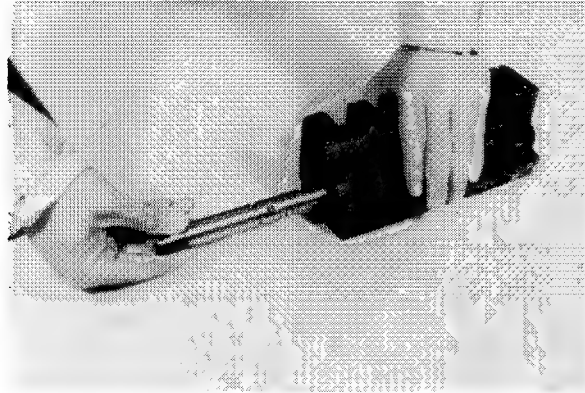


Removing the Selector Spool

LAR10-16

Remove the inching spool.

(1) Inching spool



Removing the Inching Spool

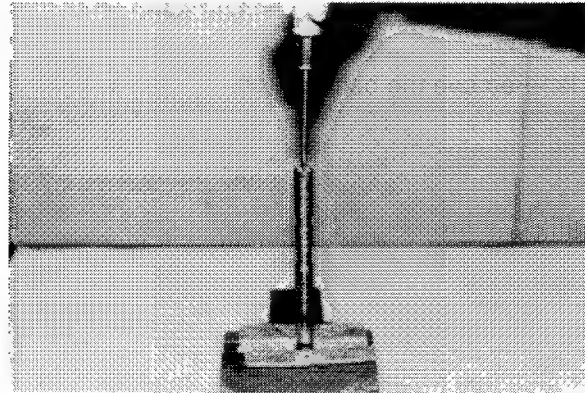
LAR10-20

Disassemble the inching spool.

Caution:

- Disassemble the inching spool only when a defect in the inching operation is found.
- Carefully operate so as not to damage the spool sliding contact surface.

(1) Fix the tip end of the spool in a vise and remove the plug.

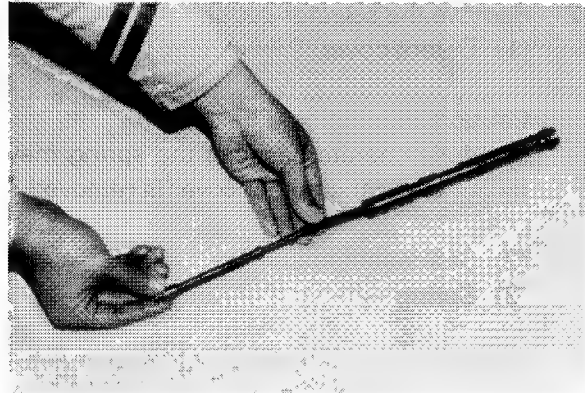


Disassembling the Inching Spool (1)

LAO168-5

(2) Inching valve

(3) Spring



Disassembling the Inching Spool (2)

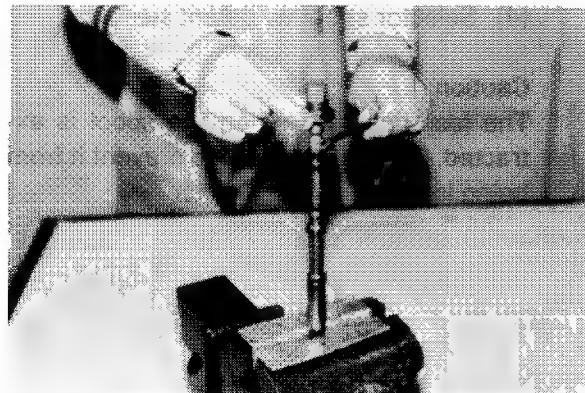
LAO168-6

Disassemble the selector spool

Caution:

- Disassemble the selector spool only when it is judged necessary.
- When replacing the spool, replace the SUB-ASSY (with detent retainer).

(1) Separate the spool and remove the detent retainer.



Disassembling the Selector Spool

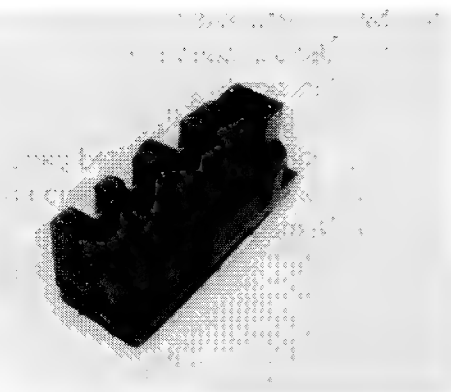
LAO166-29

INSPECTION

Caution:
Wash each part thoroughly in washing fluid
to remove dirt and dust perfectly.

1. Control valve body inspection

- (1) Crack and damage
- (2) Oil seal damage

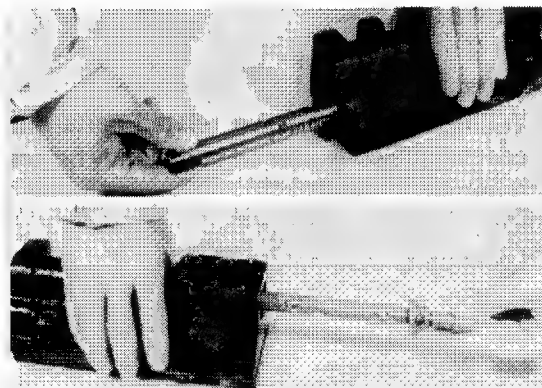


Inspecting the Valve Body

LAR10-26

Each spool inspection

- (1) Damage
- (2) Insert the spool applied with torque converter oil into the valve body and check the sliding motion: It should slide smoothly when lightly pushed and pulled with a hand.

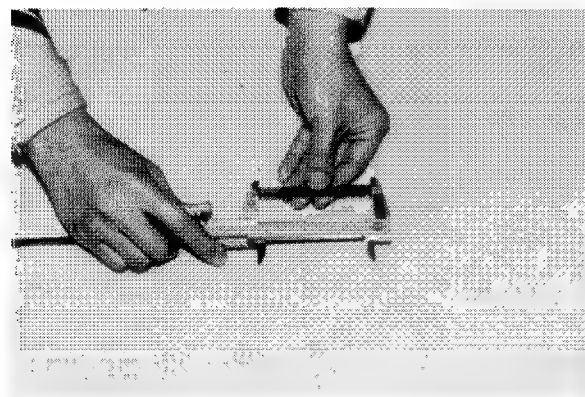


Inspecting Each Spool

LAR10-19, 28

- (3) Damage and fatigue of spring in inching spool

Free length: 73 mm (2.87 in)
Free length limit: 65.7 mm
(2.59 in)



Inspecting the Inching Valve Spring

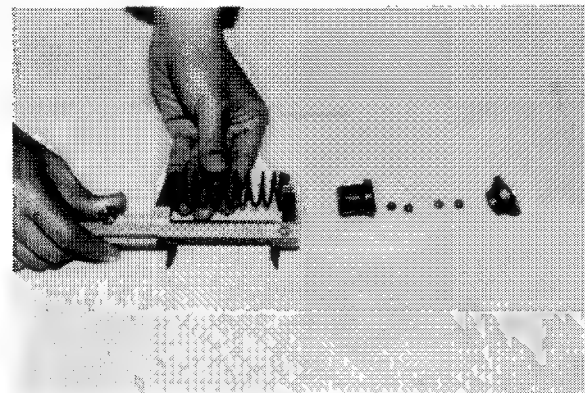
LA0168-10

3. Detent related parts inspection

- (1) Damage of detent retainer and lock ball
- (2) Fatigue of spring

Free length: 73.9 mm
(2.91 in)

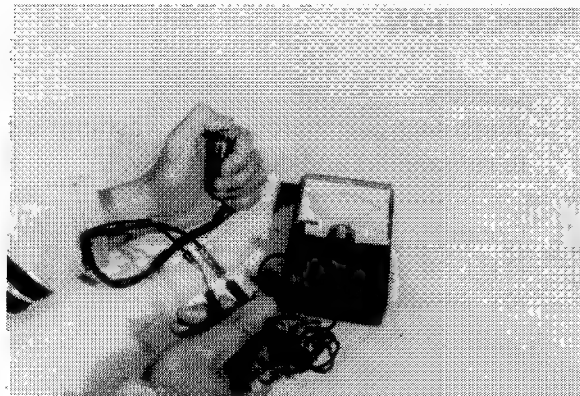
Free length limit: 66.5 mm
(2.62 in)



Inspecting the Detent Related Parts

LA0167-32

4. Switch inspection
 - (1) Use a circuit tester to inspect the switch function.
5. Inspection of lever related parts
 - (1) Damage and deformation of each part
 - (2) Damage of bushing



Inspecting the Switch

LAR10-24

ASSEMBLY

Caution:

Wash the control valve related parts and coat torque converter oil sufficiently before assembly.

1. Lever parts assembly
 - (1) Spring
 - (2) Inching lever
 - (3) Selector lever
 - (4) Connect each lever and spool.



Assembling Lever Parts

LAR1-22

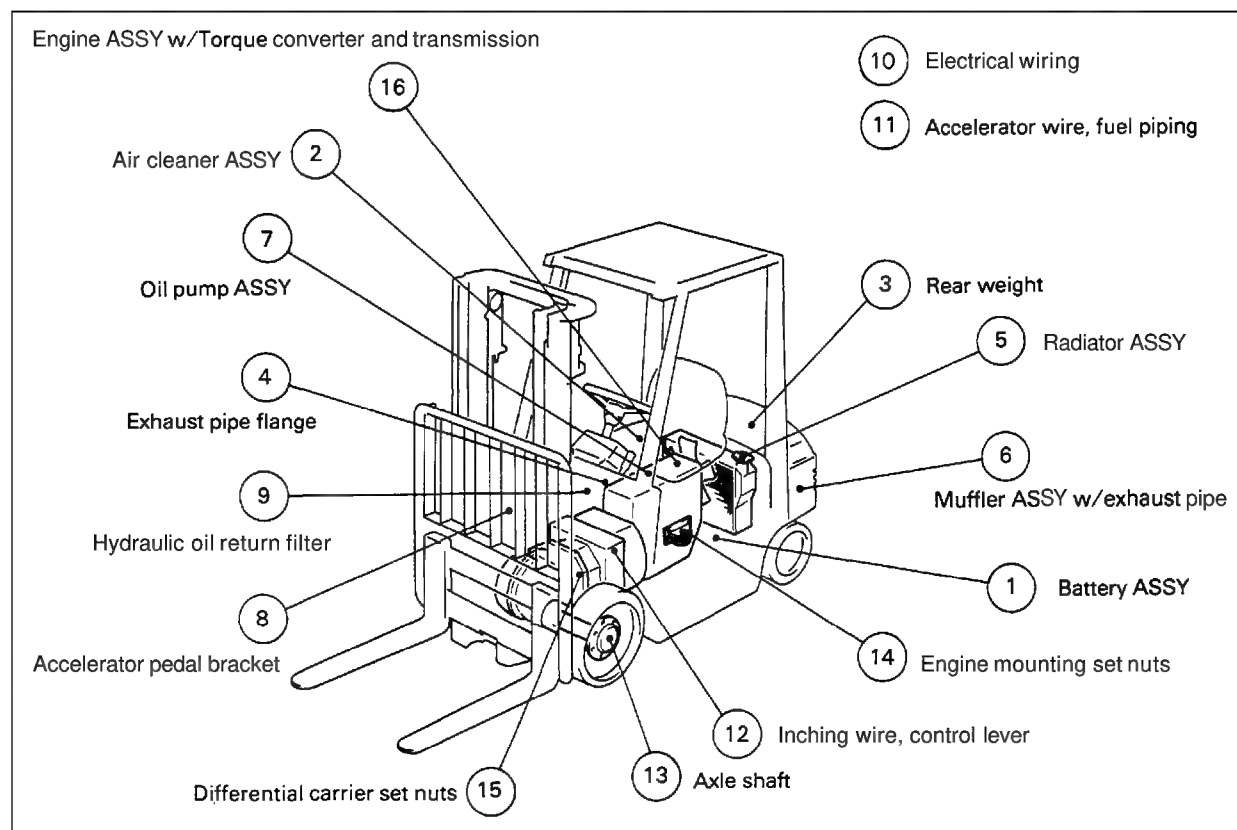
TORQUE CONVERTER W/TRANSMISSION REMOVAL & INSTALLATION

Preparation

1. Place the vehicle in the pit (to enable operation from the bottom side).
2. Fully lower the fork.
3. Remove the toe board.
4. Remove the engine hood.
5. Drain coolant (from the radiator and engine).
6. Drain differential oil.

Removal & Installation

(The number indicate the removal sequence, and the installation sequence is the reverse.)



Removal and Installation

LARM48

Removal & Installation Procedure

1. Battery ASSY and battery case **(Point I)**
2. Air cleaner ASSY **(Point 2)**
3. Rear weight **(Point 3)**
4. Exhaust pipe flange
5. Radiator and fan shroud **(Point 4)**
6. Muffler ASSY w/exhaust pipe
7. Oil pump ASSY **(Point 5)**
8. Accelerator pedal bracket
9. Hydraulic oil return filter w/hose
10. Electrical wiring (including bond cable)
11. Accelerator wire and fuel piping

12. Inching wire and control lever
13. Axle shaft (LH and RH)
14. Engine mounting set nuts
15. Differential carrier set nuts
16. Engine ASSY w/torque converter and transmission (**Point 6**)

TORQUE CONVERTER W/TRANSMISSION REMOVAL & INSTALLATION (R: Note for removal, I: Note for installation)

Point 1

1. Battery ASSY
R: Disconnect the negative \ominus terminal first.
I: Connect the negative \ominus terminal later.

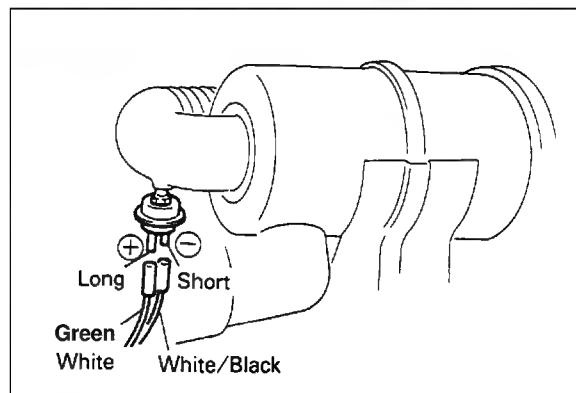


Removing the Battery

LAR25-23

Point 2

2. Air cleaner ASSY
R: Make a note on the vacuum switch wiring.
I: Carefully connect the vacuum switch wiring correctly.



Removing & Installing the Air Cleaner ASSY

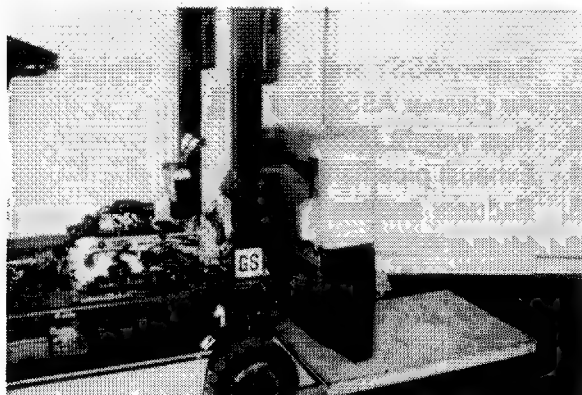
LAOS352

Point 3

3. Rear weight
R I: Carefully operate to prevent the radiator from being damaged.

Weight of rear weight

- | | |
|-----------------|--------------------------|
| 1.0 ton model: | 495 kg (1100 lbs) |
| 1.25 ton model: | 695 kg (1550 lbs) |
| 1.5 ton series: | 895 kg (2000 lbs) |



Removing the Rear Weight

LAR27-10

Point 4

5. Radiator and fan shroud

R I: Carefully operate to prevent the radiator fin from being damaged.



Removing & Installing the Radiator ASSY

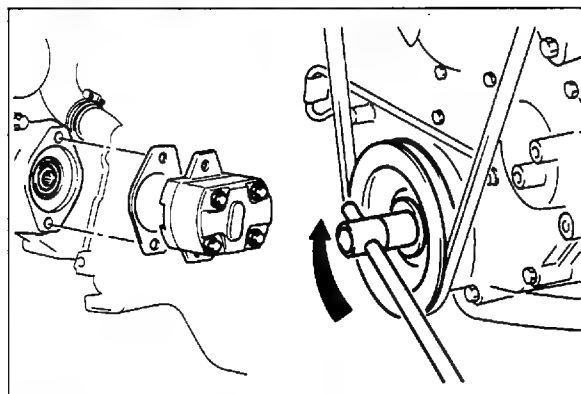
LAR24-3

Point 5

7. Oil pump ASSY

R: Always use a new packing.

I: When inserting the oil pump shaft into the flange, rotate the crankshaft for easier insertion.



Installing the Oil Pump ASSY

LARS36, 37

Point 6

16. Engine ASSY w/torque converter and transmission

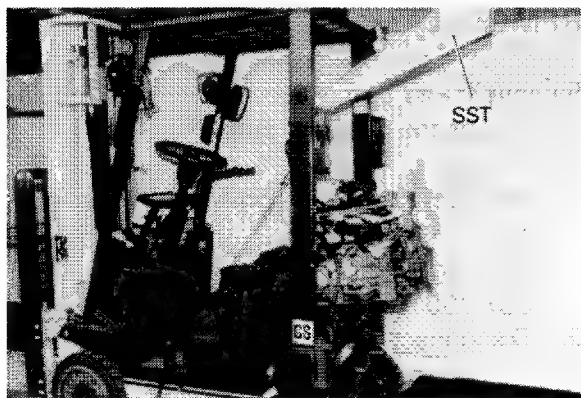
R, I: Use SST 09010-20111-71.

Carefully operate to prevent functional parts from being damaged.

Engine ASSY w/torque converter and transmission

4Y engine: 254 kg (560 lbs)

4P engine: 248 kg (546 lbs)



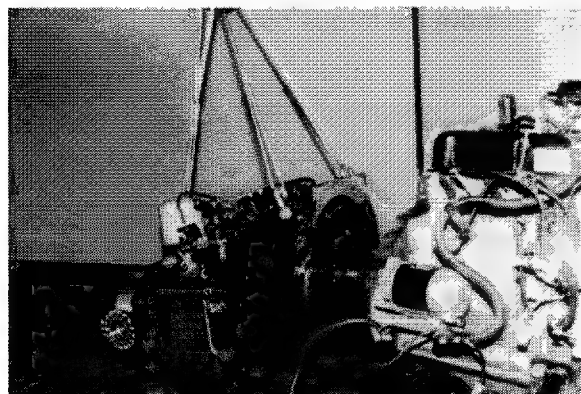
SST

LAR27-29

17. Engine ASSY separation

(1) Remove the torque converter drive plate set bolts.

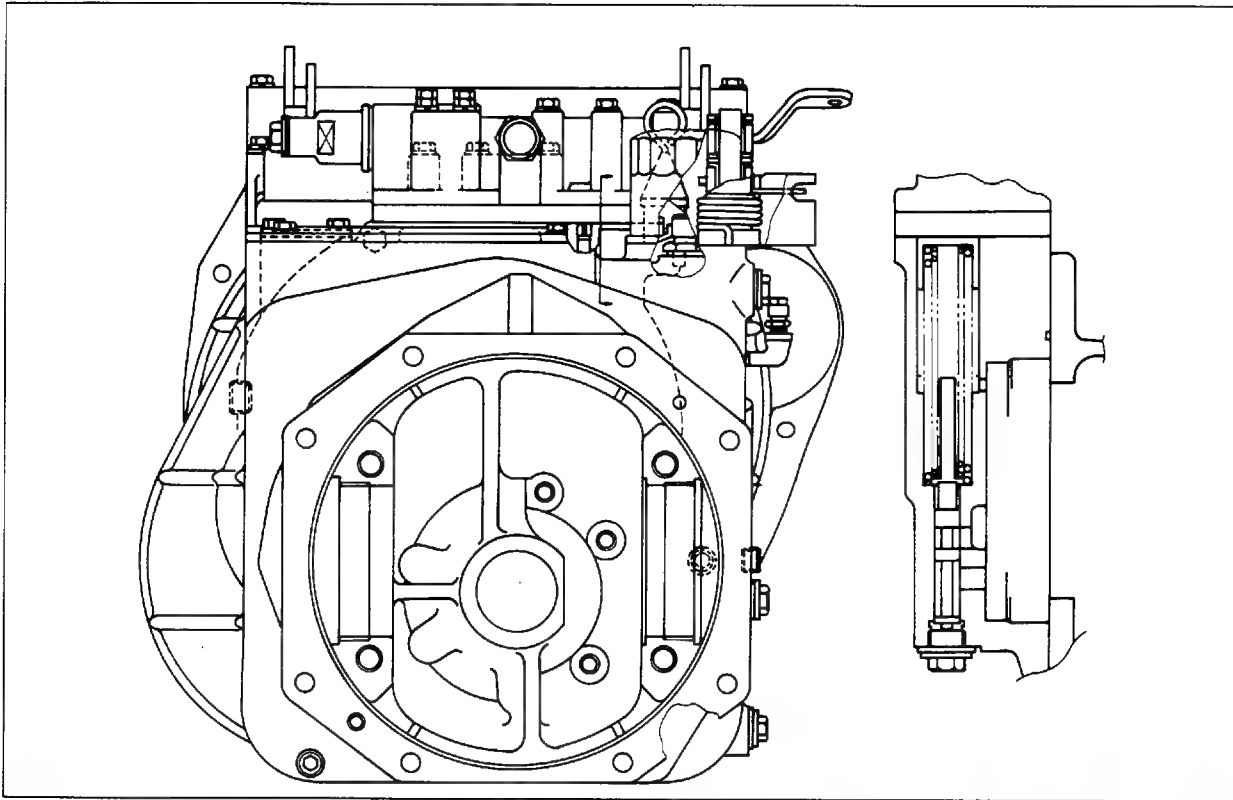
(2) Remove the torque converter housing set bolts. and separate the engine ASSY.



Separating the Engine ASSY

LAR25-1

OIL PUMP CASE SUB-ASSY



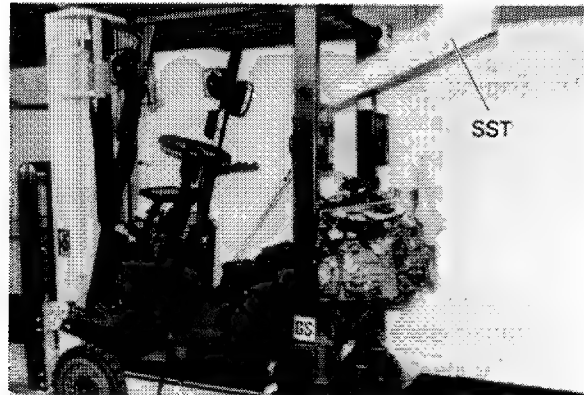
Accumulator & Regulator Valve

LARM7

REMOVAL

Remove the oil pump, accumulator and regulator valve as the oil pump case SUB-ASSY.

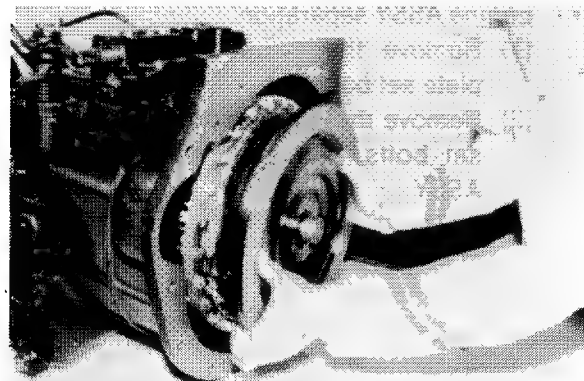
1. Remove the torque converter w/transmission.
See page 2-23.
SST09010-20111-71
2. Disconnect the engine ASSY.



Engine W/Torque Converter & Transmission

LAR27-29

3. Remove the torque converter.

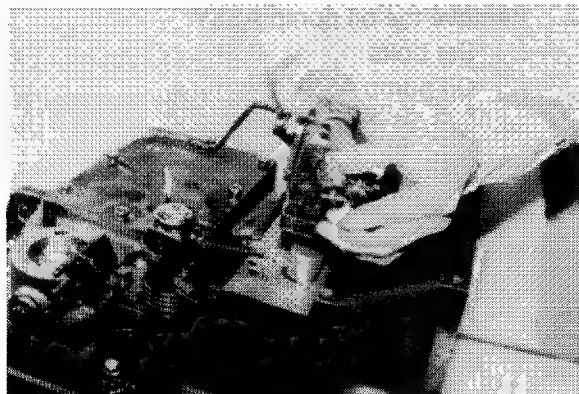


Removing the Torque Converter

LAR1-16

Remove the control valve ASSY.

- (1) Set bolt
- (2) Control valve ASSY



Removing the Control Valve ASSY

LAR1-19

Remove the accumulator piston and springs.

- (1) Piston
- (2) Springs large, medium and small



Removing the Accumulator

LAR1-24

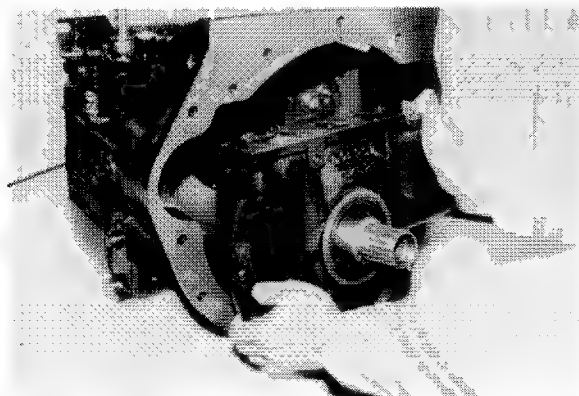
6. Remove the oil pump case SUB-ASSY.

- (1) Set bolts and nuts
- (2) Oil pump case SUB-ASSY

Reference:

Use the service bolt hole on the pump case.

Service bolt: M8, P = 1.25



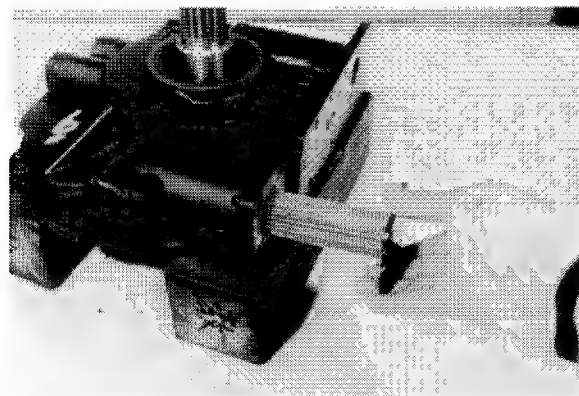
Removing the Oil Pump Case

LAR2-2

DISASSEMBLY

1. Remove the oil filter ASSY

- (1) Set bolt
- (2) Oil filter ASSY

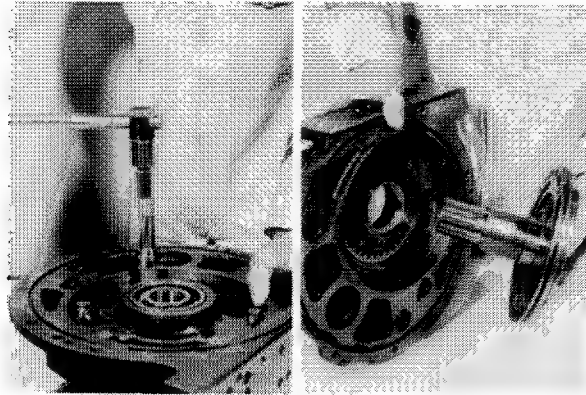


Removing the Oil Filter ASSY

LAR6-25

2. Remove the oil pump ASSY.

- (1) Set bolts
- (2) Oil pump ASSY



Removing the Oil Pump ASSY

LAR6-30,32

3. Remove the regulator valve.

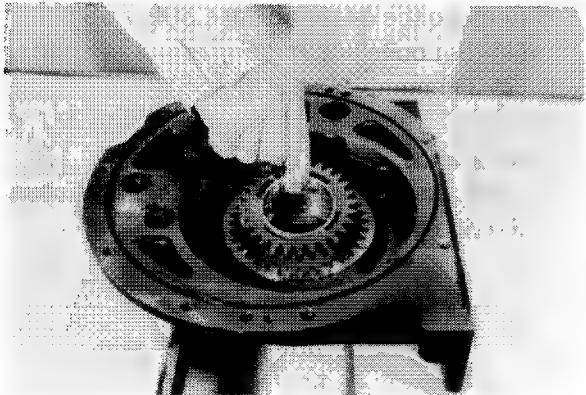
- (1) Stopper plug
- (2) Regulator valve



Removing the Regulator Valve

LAR7-20

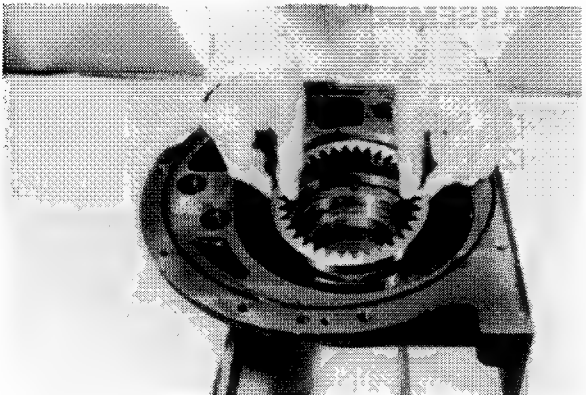
4. Remove the oil pump drive gear.



Removing the Drive Gear

LAR7-25

5. Remove the oil pump driven gear.



Removing the Driven Gear

LAR7-24

INSPECTION

Caution:

The roughly wash each part in the washing fluid to eliminate dirt and dust perfectly.

1. Accumulator and regulator valve parts
 - (1) Regulator valve damage
 - (2) Clean the regulator valve orifice by blowing compressed air.

- (3) Spring damage and fatigue

Free length

Large (for accumulator):

119.6 mm (4.71 in)

Medium (for regulator valve):

135.3 mm (5.33 in)

Small (for regulator valve):

123.7 mm (4.87 in)

Free length limit

Large (for accumulator):

107.5 mm (4.23 in)

Medium (for regulator valve):

121 mm (4.76 in)

Small (for regulator valve):

111 mm (4.37 in)

- (4) Accumulator piston damage

Stator shaft

- (1) Damage
- (2) Clogged oil hole
- (3) Damage on oil pump gear sliding contact surface
- (4) Wear of oil pump drive gear bushing sliding contact surface

Stator shaft outside diameter standard:

55 (2.165 in)

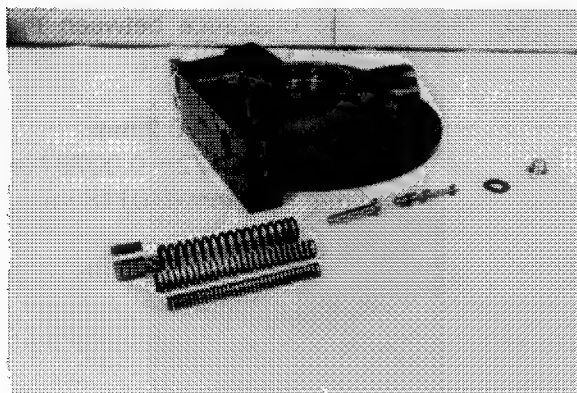
Wear limit: 54.8 (2.157 in)

- (5) Bearing rotation and abnormal noise
Replace the bearing if any abnormality is observed.

SST 09608-35014

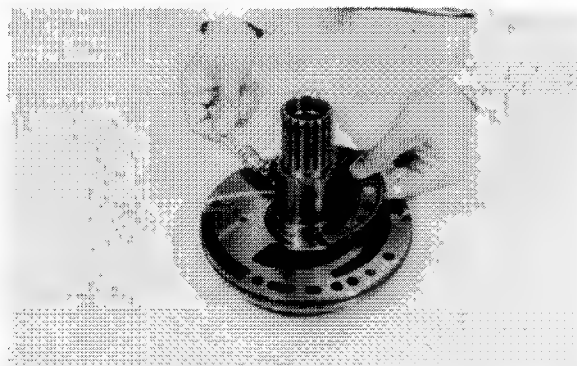


Inspecting and Cleaning Clogged Orifice LAR7-23, LA0165-5



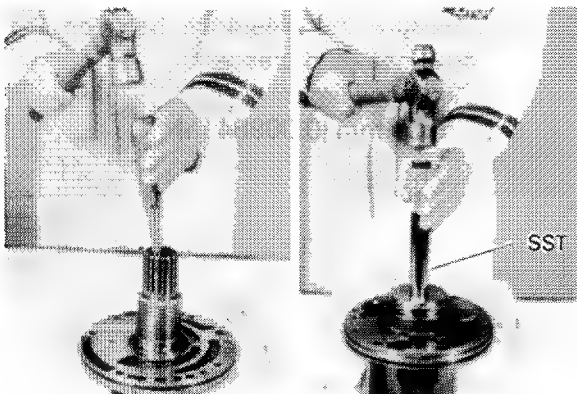
Inspecting the Accumulator and Regulator Valve Parts

LAR7-22



Inspecting the Stator Shaft

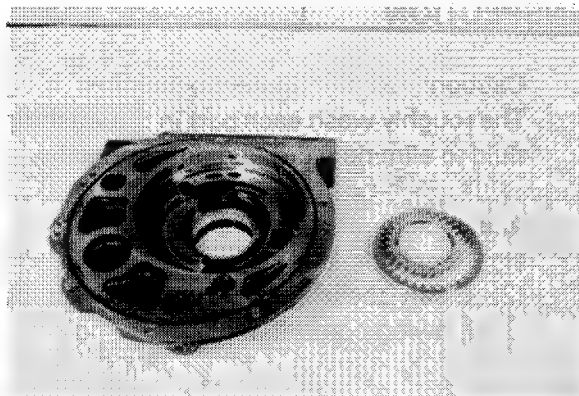
LAR7-10



Replacing the Bearing

LAR8-1,2

3. Inspect the oil pump case (body) and gears.
 - (1) Crack and damage of oil pump body
 - (2) Crack and damage of drive and driven gears



Oil Pump Inspection (1)

LAR7-16

- (3) Measure the clearance between the driven gear and pump body.

Clearance standard:

0.12 — 0.2 mm

(0.00472 ~ 0.00787 in)

Wear limit: 0.3 mm (0.0118 in)

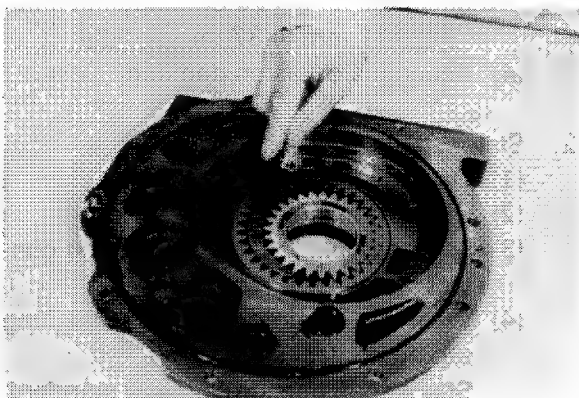


Oil Pump Inspection (2)

LAR7-6

- (4) Measure the clearance between the driven gear and crescent.

Clearance limit: 0.4 mm (0.0157 in)



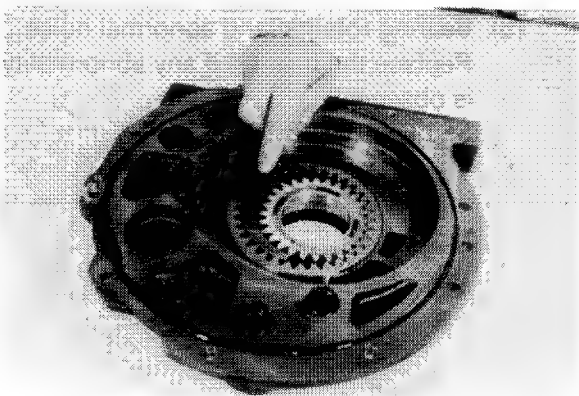
Oil Pump Inspection (3)

LAR6-35

- (5) Measure the clearance between the drive gear and crescent.

Clearance limit:

0.25 mm (0.00984 in)



Oil Pump Inspection (4)

LAR6-36

- (6) Measure the clearance between the pump drive gear bushing and stator shaft.

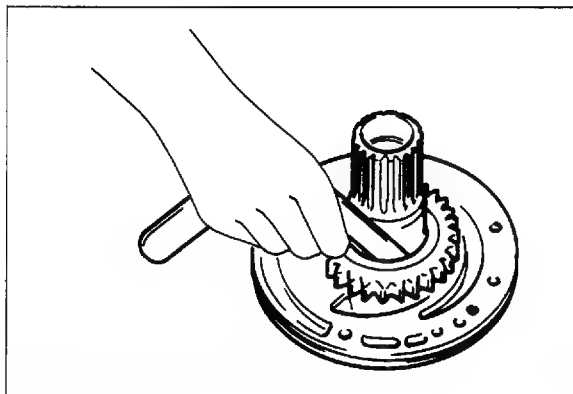
Clearance standard:

0.03 ~ 0.079 mm

(0.001181 ~ 0.00311 in)

Clearance limit:

0.15 mm (0.00591 in)



Oil Pump Inspection (5)

LARS64

- (7) Measure the clearance between the pump body surface and each gear.

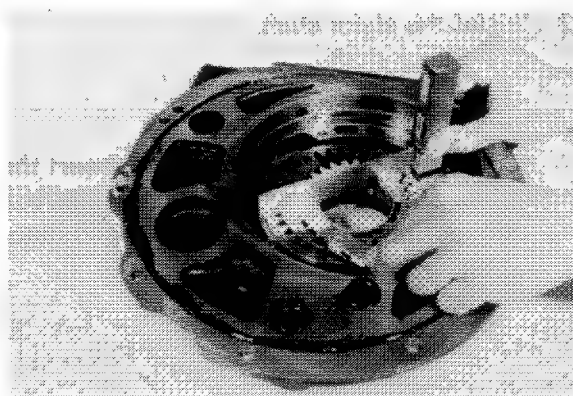
Clearance standard:

0.06 ~ 0.08 mm

(0.00236 ~ 0.00315 in)

Clearance limit:

0.12 mm (0.00472 in)



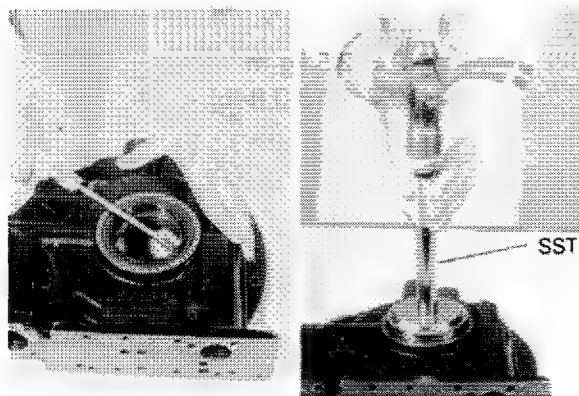
Oil Pump Inspection

LAR7-8

- (8) Damage of the oil pump case oil seal
Replace the oil seal if any damage is found on the lip portion.
SST 09608-35014

Caution:

After assembly apply grease on the oil seal lip portion.



Replacing the Oil Seal

LAR7-17,18

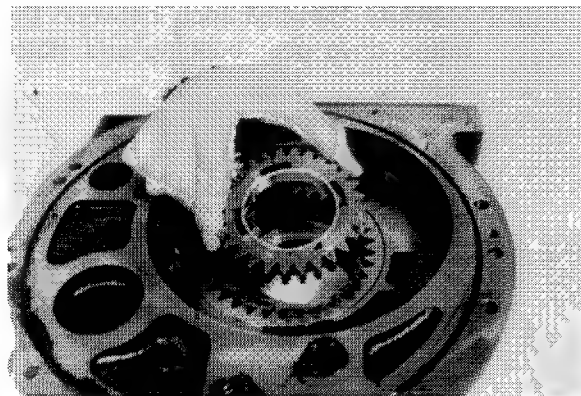
ASSEMBLY

1. Assemble the oil pump.

Caution:

Apply torque converter oil sufficiently on each gear.

- (1) Driven gear
- (2) Drive gear



Assembling the Oil Pump

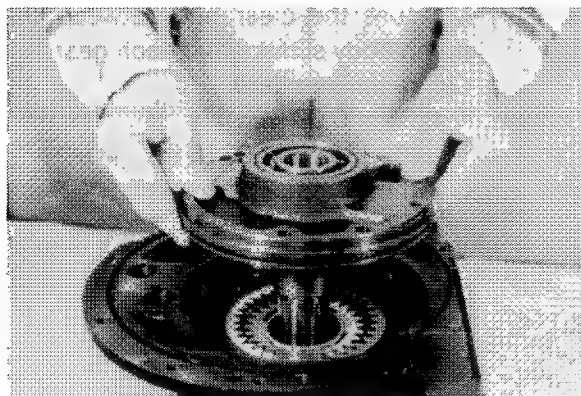
LAR7-13

Install the stator shaft.

- (1) Stator shaft

Important:

Coat grease on the O-ring, and insert the stator shaft straight after aligning the bolt hole positions and the pump case and stator shaft.

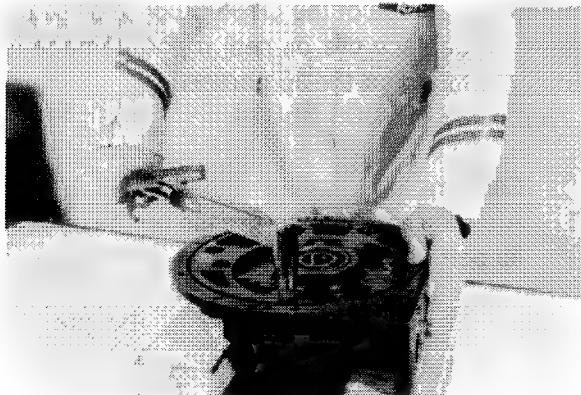


Installing the Stator Shaft

LAR7-27

- (2) Set bolt

$T = 1.9 \sim 2.5 \text{ kg-m}$
(13.7 ~ 18.0 ft-lb)



Tightening Torque

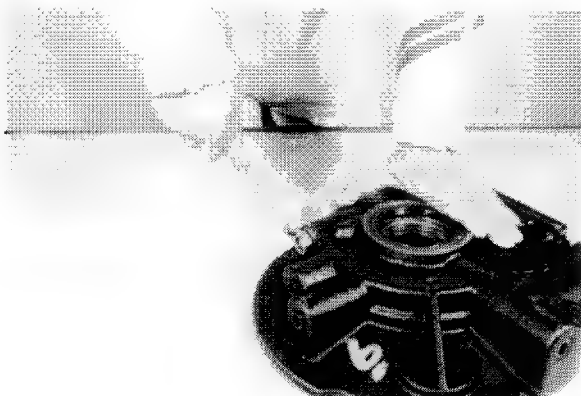
LAR8-3

3. Install the regulator valve.

- (1) Regulator valve
- (2) Install the seal washer on the plug and tighten the plug.

INSTALLATION

The installation procedure is the reverse of the removal procedure.



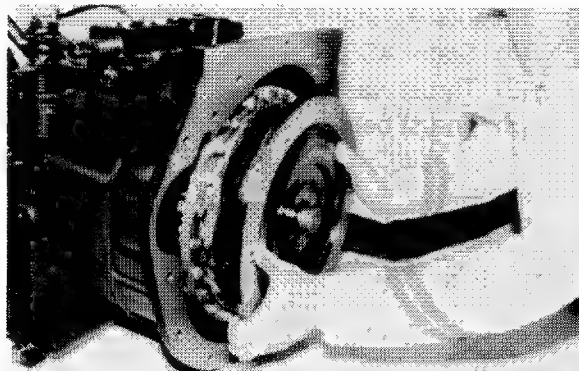
Installing the Regulator Valve

LAR7-20

TORQUE CONVERTER

REMOVAL

1. Take off the torque converter from the stator shaft.

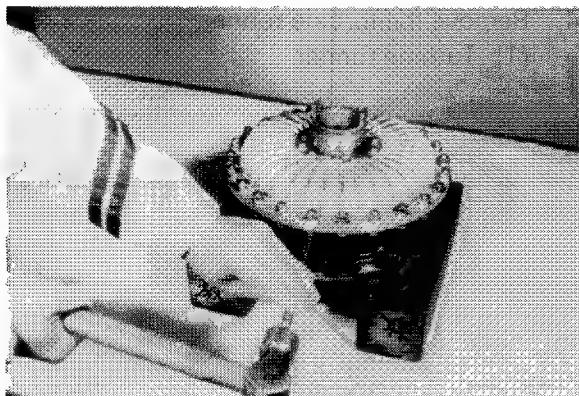


Removing the Torque Converter

LAR1-16

DISASSEMBLY

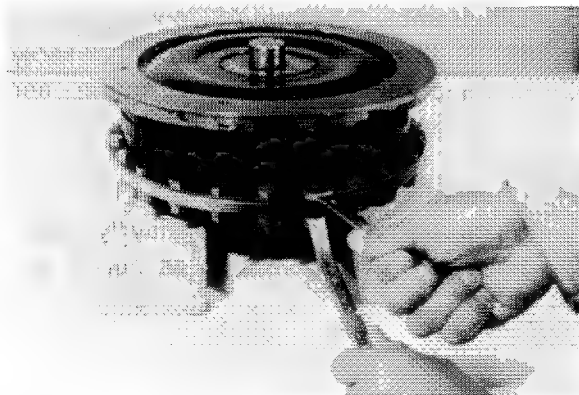
1. Torque converter oil draining
 - (1) Remove the drain plug and drain torque converter oil.
2. Pump impeller removal
 - (1) Punch the match mark on the drive cover and pump impeller.



Punching the Match Mark

LAR11-17

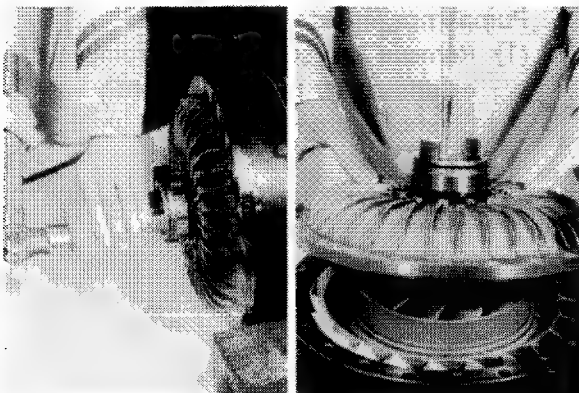
- (2) Remove the drive cover set bolts and nuts.



Removing the Set Bolts and Nuts

LAR8-7

- (3) Use a proper round rod and lightly tap the drive cover from the extension side to separate the drive cover from the pump impeller.
 - (4) O-ring

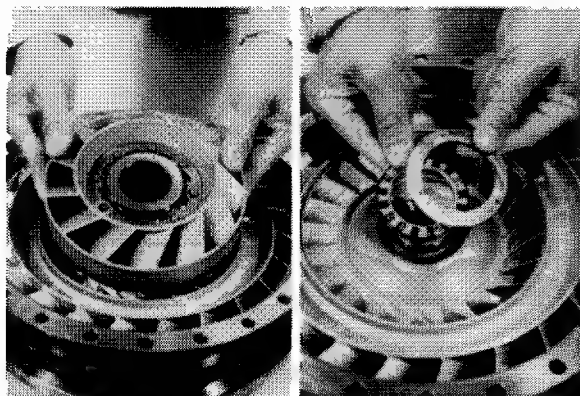


Removing the Pump Impeller

LAR8-11,12

Remove the stator ASSY.

- (1) Stator ASSY
- (2) Thrust washer
- (3) Thrust bearing

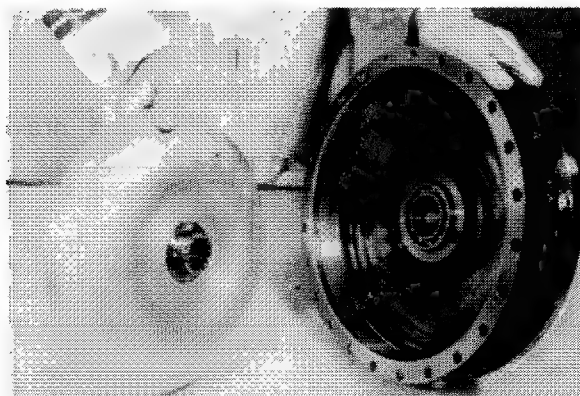


Removing the Stator ASSY

LAR8-16,17

4. Remove the turbine runner.

- (1) Turbine runner



Removing the Turbine Runner

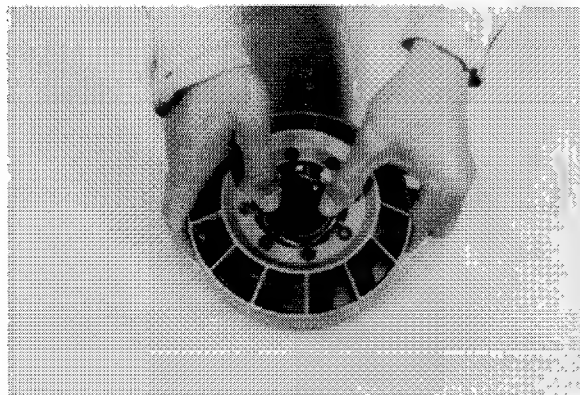
LAR8-18

Disassemble the stator ASSY.

- (1) Push out the stator hub (inner race). and remove the roller, spring, and spring cap.

Caution:

Since spring and other parts may fly out at a time, carefully operate so as not to lose them.

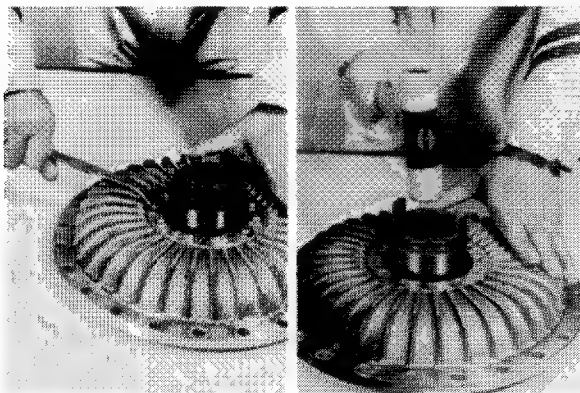


Disassembling the Stator ASSY

LARS-6

Pump impeller extension removal

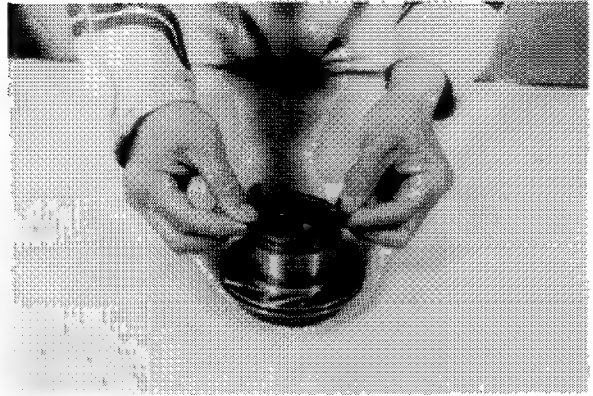
- (1) Remove the set bolt and remove the extension by tapping it lightly with a plastic hammer.



Removing the Extension

LAR8-23,25

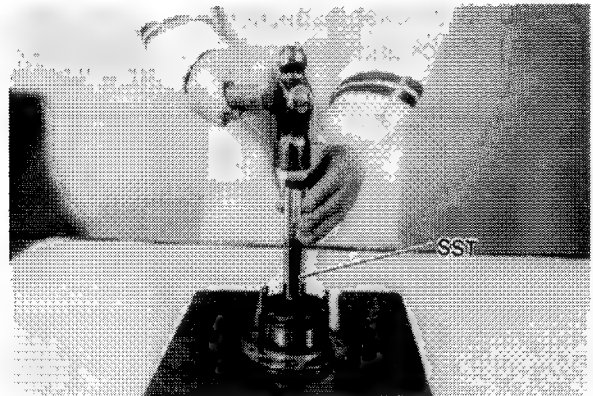
- (2) Seal ring
- (3) O-ring



Removing the Seal Ring

LAR8-31

- (4) Snap ring
 - (5) Bearing
- SST 09608-3501 4



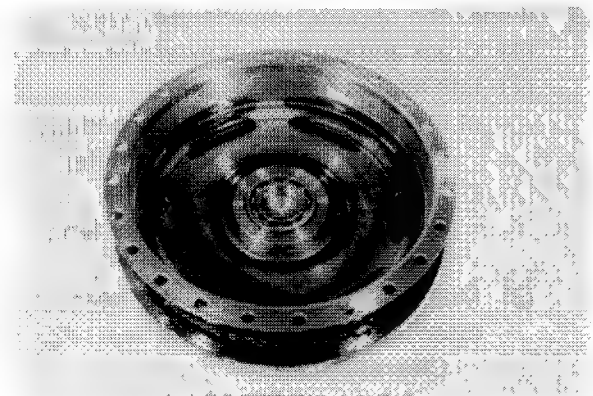
Removing the Bearing

LAR8-32

INSPECTION

Caution:
Thoroughly wash each part in the washing fluid to eliminate dirt and dust perfectly.

1. Drive cover inspection
 - (1) Crack and damage
 - (2) Abnormal noise and rotation of bearing



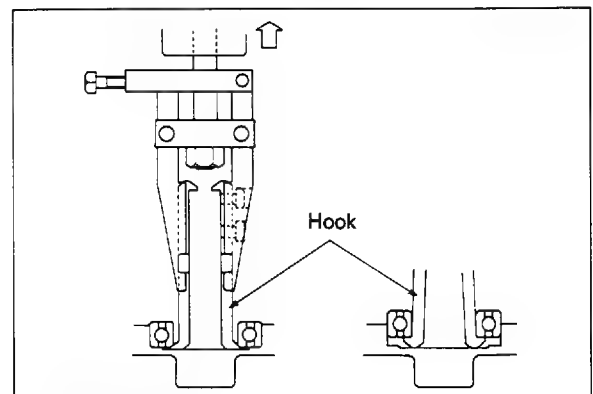
Drive Cover Inspection

LAR8-22

- (3) Bearing replacement
 - ① Bearing removal

SST 09320-23000-7 1

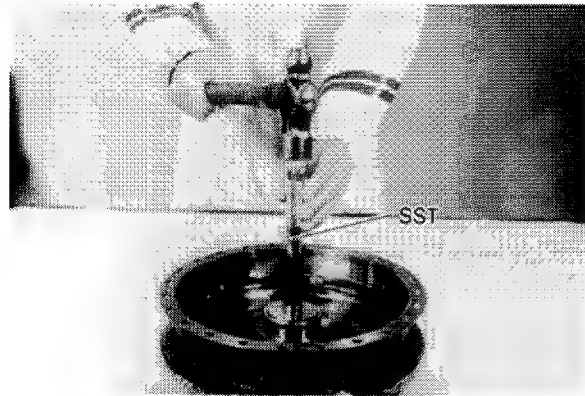
Important:
The hooks at both ends of the SST are different in shape. Use them selectively.



Removing the Bearing

LAOM221

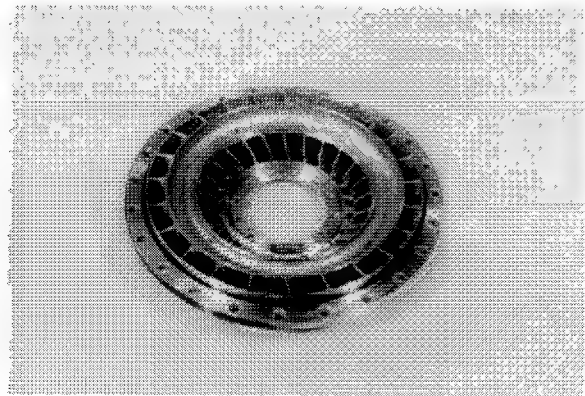
② Bearing installation
SST 09608-1 2010



Installing the Bearing

LAR8-21

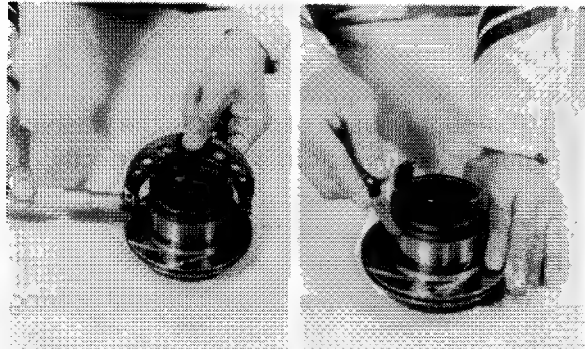
2. Pump impeller inspection
(1) Crack and damage



Inspecting the Pump Impeller

LAR8-34

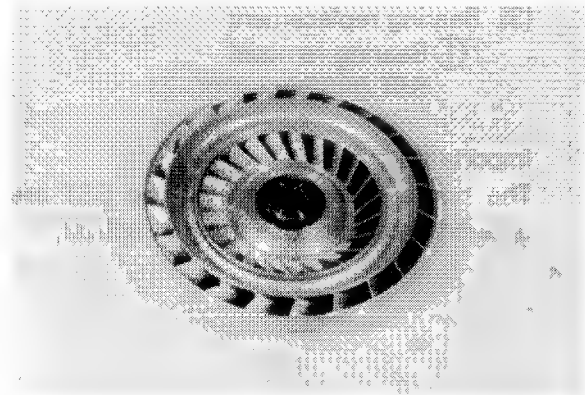
3. Inspection of pump impeller extension
- (1) Crack and damage at extension pawl
 - (2) Use a micrometer to measure the wear of the oil seal sliding contact surface.
Boss standard outside diameter:
70 mm (2.756 in)
Boss outside diameter wear limit:
69.8 mm (2.748 in)
 - (3) Measure the clearance between the extension boss groove and seal ring.
Clearance limit:
0.3 mm (0.00118 in)



Extension Inspection

LAR8-36,26

4. Turbine runner inspection
(1) Crack and damage

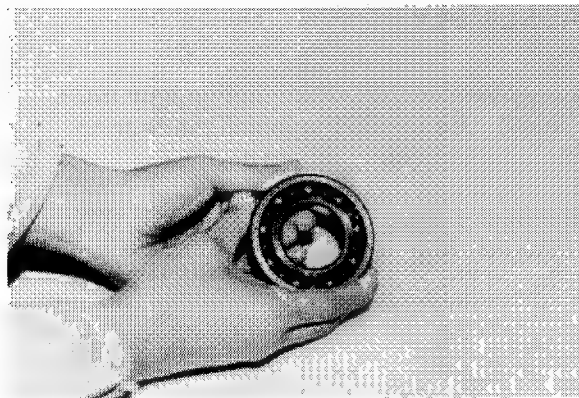


Turbine Runner Inspection

LAR8-33

Bearing inspection

- (1) Rotation status, abnormal noise, and looseness

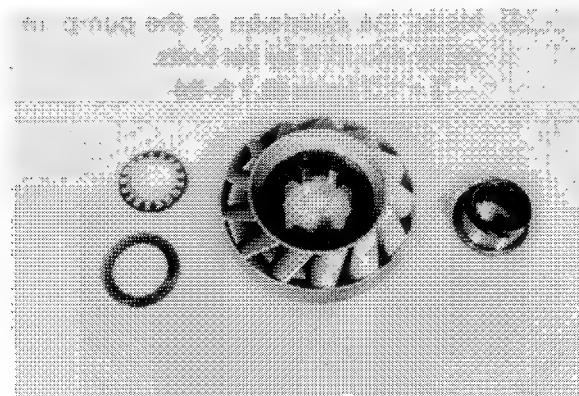


Bearing Inspection

LA0170-28

6. Stator related parts inspection

- (1) Crack and damage of stator wheel
- (2) Damage of stator hub
- (3) Damage, deformation and seizure of thrust washer and spacer
- (4) Rotation status of thrust bearing



Stator Related Parts Inspection

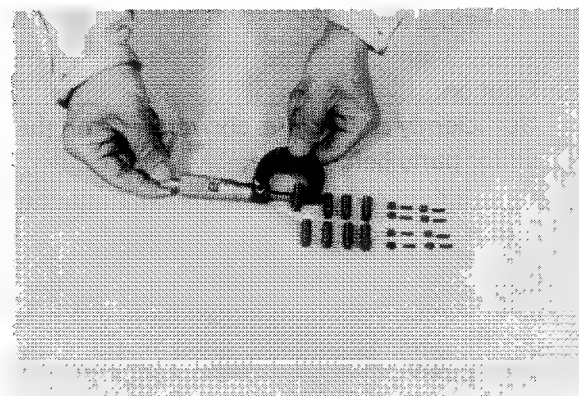
LAR9-13

- (5) Damage of rollers, springs and spring caps
- (6) Use a micrometer and measure the wear of the roller.

Roller outside diameter standard:

8.2 mm (0.3228 in)

Wear limit: 8.05 mm (0.3169 in)



Roller Inspection

LAR9-8

(7) Stator hub wear inspection

Fit the hub to the stator wheel and measure the clearance between the hub and cam with a thickness gauge.

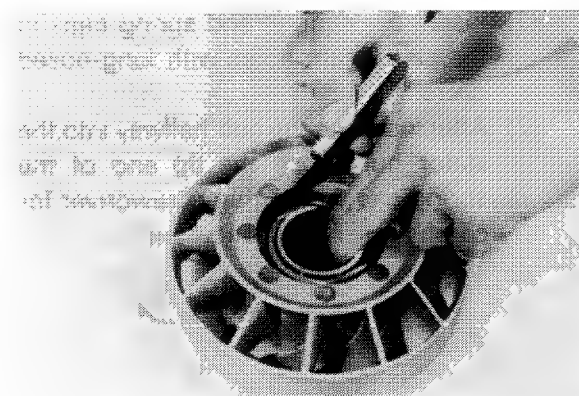
Standard clearance between hub and cam:

0.08 ~ 0.119 mm

(0.00315 ~ 0.00220 in)

Hub to cam clearance limit:

0.15 mm (0.0059 in)

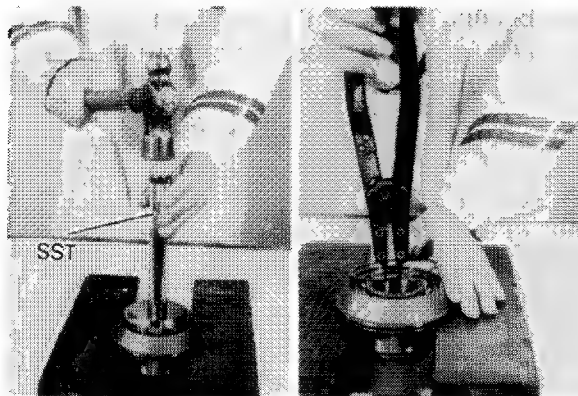


Stator Hub Wear Inspection

LAR9-10

ASSEMBLY

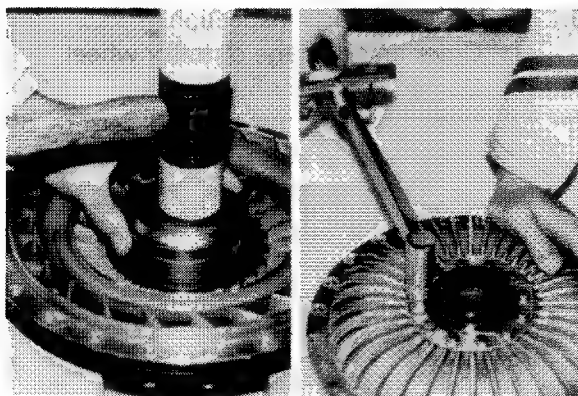
1. Assemble the pump impeller extension.
 - (1) Use the SST to install the bearing.
SST 09608-35014
 - (2) Snap ring
 - (3) Install the O-ring and seal ring to the extension, and apply grease to the O-ring and seal ring.



Installing the Bearing

LARS-28.27

- (4) Install the extension to the pump impeller and fix it by set bolts.
 $T = 1.2 \text{ kg-m (8.7 ft-lb)}$



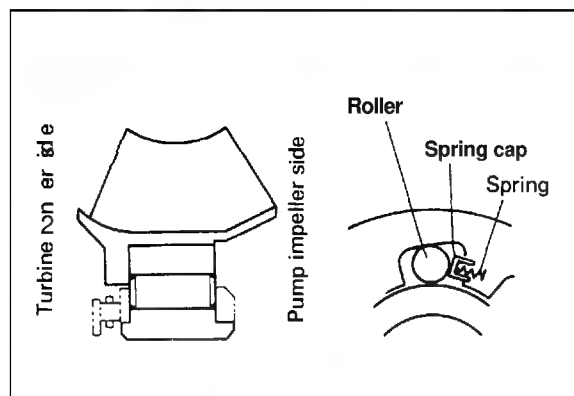
Installing the Extension

LA0171-10,12

2. Assemble the stator.

Caution:

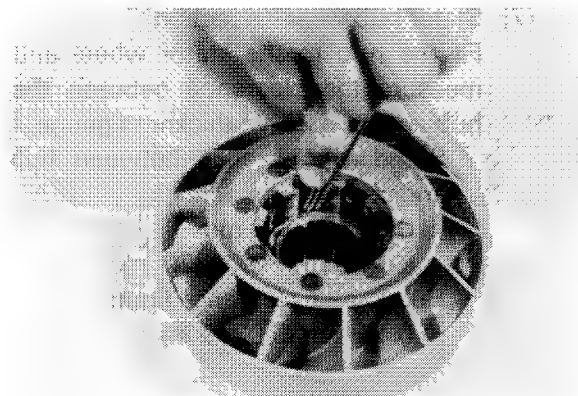
Sufficiently coat torque converter oil on the stator parts before assembly.



Assembling the Stator

LA0S420

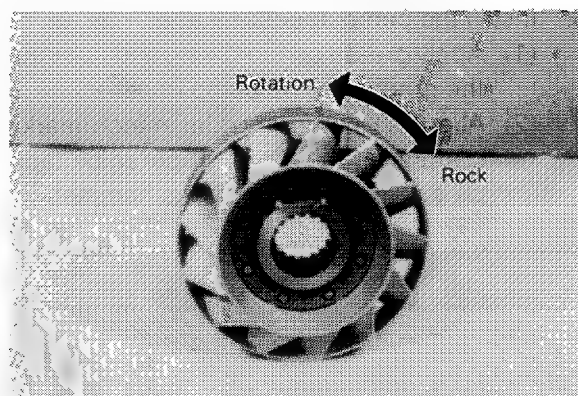
- (1) Install the springs and spring caps in the stator cam holes with long-nosed pliers.
 - (2) After inserting the hub halfway into the stator hub, push the tip end of the spring cap with a thin screwdriver for careful roller installation one by one.



Installing the Roller

LARS-19

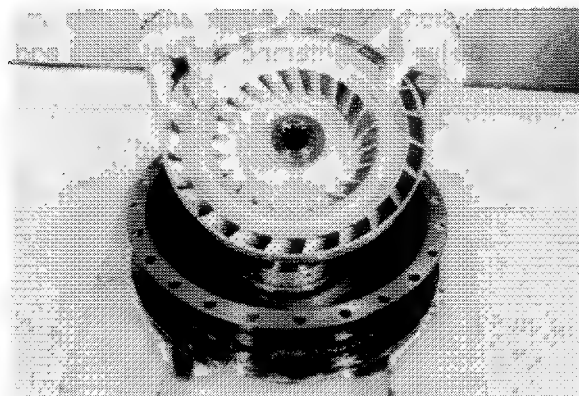
- (3) Inspect the stator rotating status.
Fix the hub with a hand and rotate the stator wheel manually to check the rotation and the locking direction.



Checking the Stator Rotation Status

LAR9-5

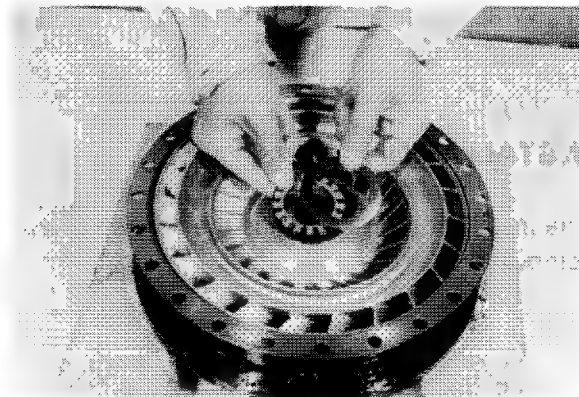
3. Install the turbine runner to the drive cover.



Installing the Turbine Runner

LAR9-21

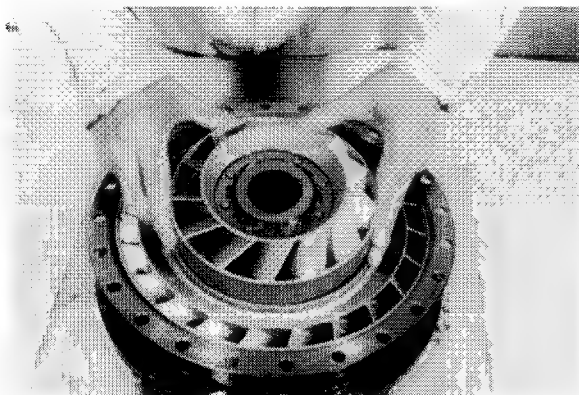
4. Install the thrust bearing and thrust washer.



Installing the Thrust Bearing and Washer

LAR9-22

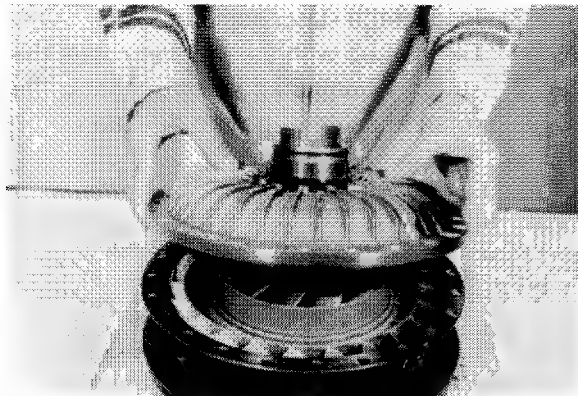
5. Install the stator ASSY.



Installing the Stator ASSY

LAR9-23

6. Install the pump impeller.
 - (1) Apply grease on the O-ring and fit it into the groove on the pump impeller.
 - (2) Align the pump impeller match mark, and install the pump impeller by tapping it lightly with a plastic hammer.

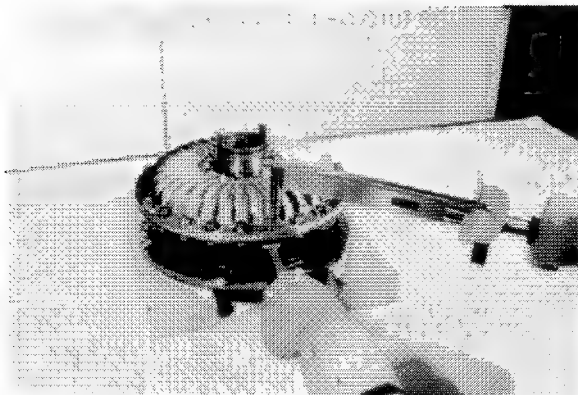


Installing the Pump Impeller

LAR9-24

- (3) Fasten the drive cover and pump impeller by tightening the set bolts and nuts.

$T = 2.5\text{kg}\cdot\text{m}$ (18.0 ft-lb)



Installing the Drive Cover

LAR10-9

7. Wrap seal tape on the drain plug and tighten it.

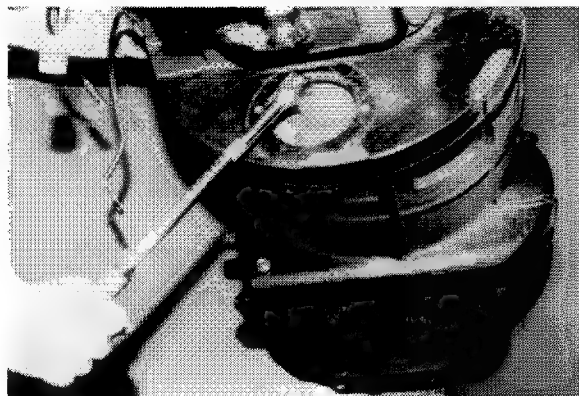
INSTALLATION

The installation procedure is the reverse of the removal procedure.

TRANSMISSION

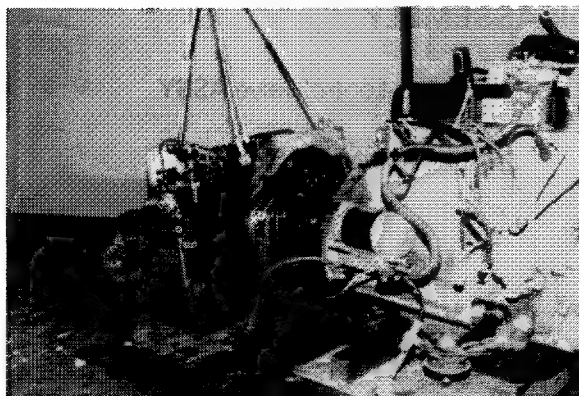
REMOVAL

1. Remove the torque converter & transmission.
 - (1) Engine w/torque converter & transmission
See page 2-23.
 - (2) Separate the engine ASSY from the torque converter & transmission.
 - ① Torque converter drive plate set bolts
 - ② Torque converter housing set bolts



Removing the Drive Plate Set Bolts

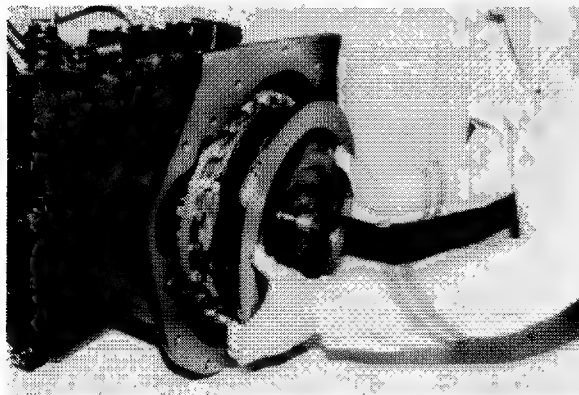
LAR21-31



Separating the Torque Converter & Transmission

LAR25-1

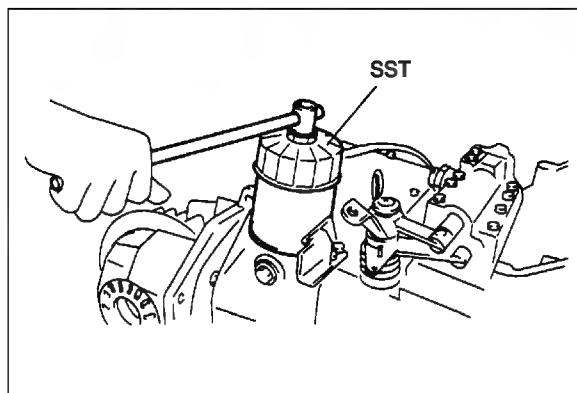
2. Remove the torque converter ASSY.



Removing the Torque Converter ASSY

LAR1-16

3. Drain torque converter oil.
 - (1) Remove the drain plug to drain torque converter oil.
Oil quantity: 9.5ℓ (2.51 US gal)
4. Remove the oil filter.
SST 09228-07500

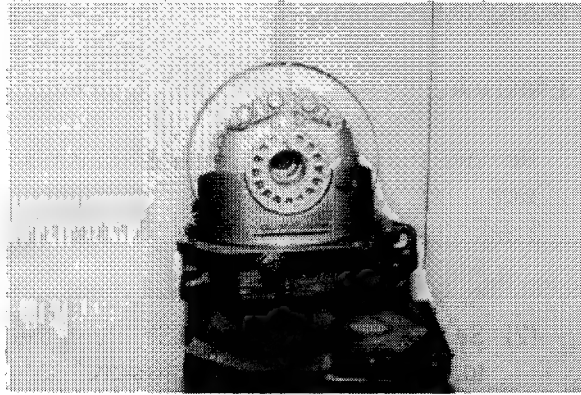


Removing the Oil Filter

LARS65

Remove the differential carrier ASSY.

- (1) Reverse the torque converter with transmission to bring the torque converter housing below and differential carrier ASSY upward.
- (2) Differential carrier set bolts
- (3) Differential carrier ASSY

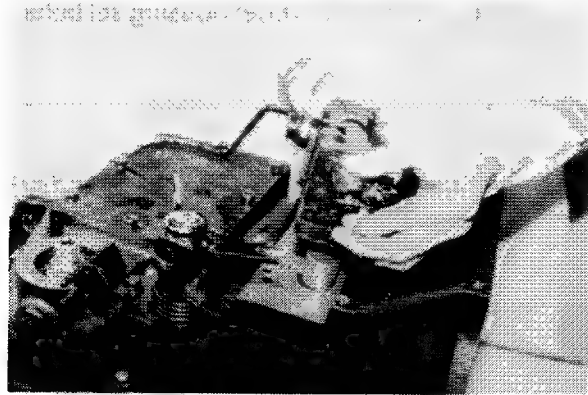


Removing the Differential Carrier ASSY

LAR1-34

DISASSEMBLY

1. Remove the control valve ASSY
 - (1) Set bolt
 - (2) Control valve ASSY
 - (3) Accumulator parts
2. Remove the oil level gauge.



Removing the Control Valve ASSY

LAR1-19

Remove the inching lever and selector lever.

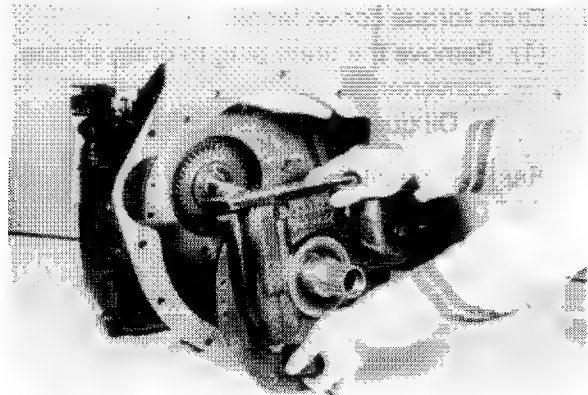
- (1) Snap ring
- (2) Selector lever
- (3) Inching lever
- (4) Spring



Lever Related Parts

LAR1-26

4. Remove the upper cover
5. Remove the oil pump case SUB-ASSY.
 - (1) Set bolts and nuts
 - (2) Pump case SUB-ASSY

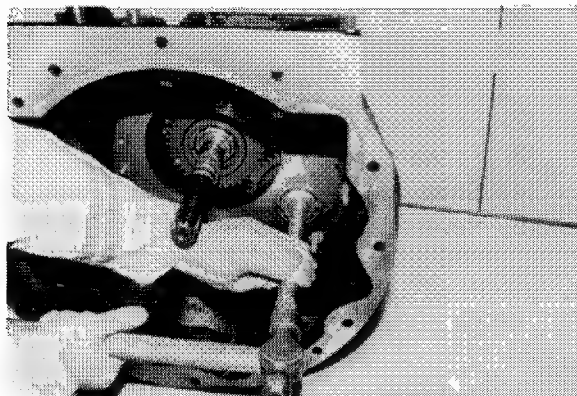


Removing the Pump Case SUB-ASSY

LAR2-2

Remove the counter-gear related parts

- (1) Seal plate
- (2) Unlock the lock plate.
- (3) Set bolt
- (4) Snap rings (2 pcs.)
- (5) Drive out the countershaft.



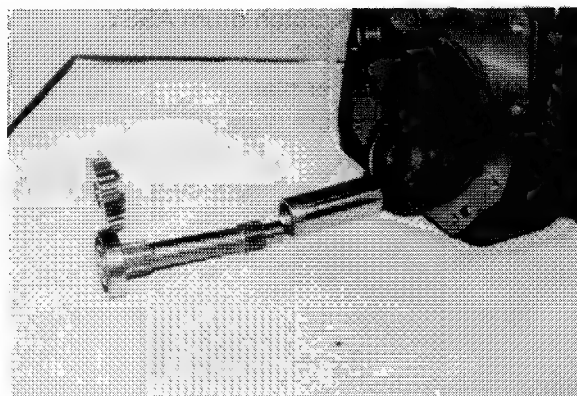
Driving out the Countershaft

LAR2-16

- (6) Remove the countershaft, counter gears No. 1 and No. 2, and spacer.

Caution:

Make a memo on the gear mounting directions.

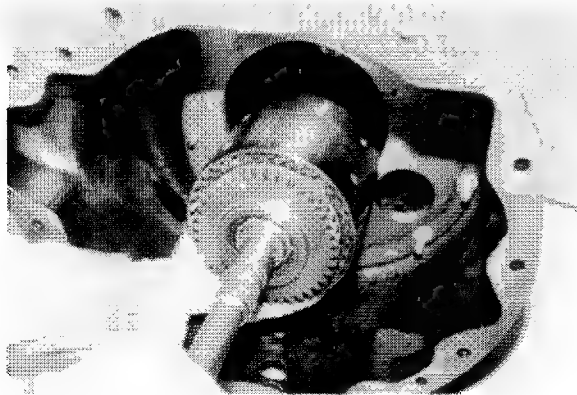


Removing the Countergear Related Parts

LAR2-17

7. Remove the clutch drum ASSY.

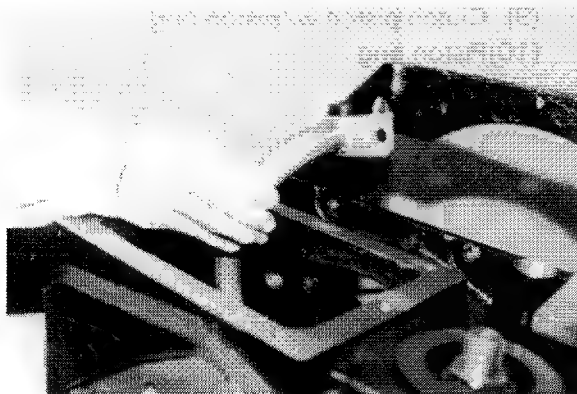
- (1) Seal plate
- (2) Snap ring
- (3) Drive out the clutch drum ASSY.



Removing the Clutch Drum ASSY

LAR3-2

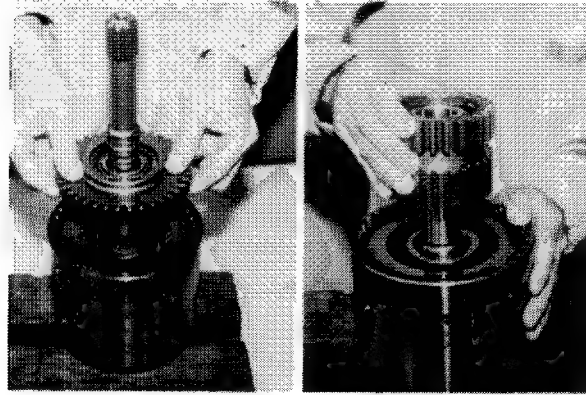
8. Remove the oil filter pipe.



Removing the Pipe

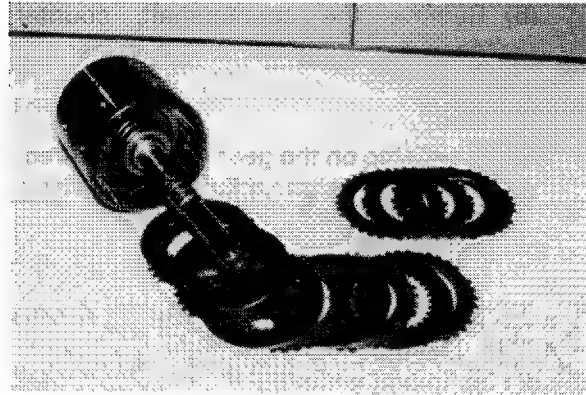
LAR3-6

9. Remove the forward and reverse clutch gears.
 - (1) Seal rings (4 pcs.)
 - (2) Snap ring
 - (3) Forward clutch gear
 - (4) Snap ring
 - (5) Reverse clutch gear



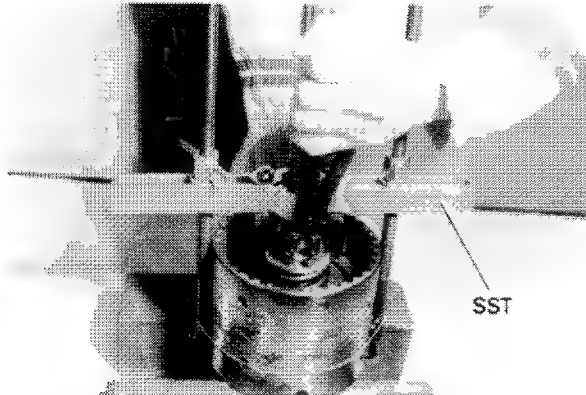
Removing the Forward and Reverse Clutch Gears LAR3-11.14

10. Disassemble the clutch drum ASSY.
 - (1) Snap ring
 - (2) Clutch camber plate
 - (3) Clutch pressure plate
 - (4) Clutch plate
 - (5) Clutch disc



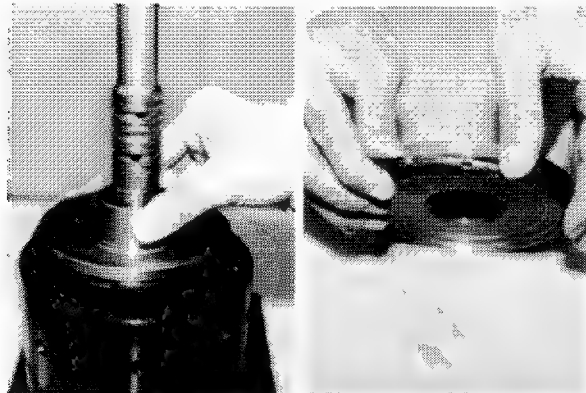
Removing the Clutch Plate and Clutch Disc LAR3-34

- (6) Snap ring
SST 09220-22000-71
- (7) Spring retainer
- (8) Clutch spring



Removing the Snap Ring LAR3-36

- (9) Clutch piston w/piston ring
- (10) Piston ring



Removing the Piston LAR4-2.10

INSPECTION

1. Clutch drum inspection

- (1) Visually check discoloration of the clutch disc, clutch plate and pressure plate.

If discolored extremely, replace with new parts.



Inspecting the Clutch Plate and Disc

LAR4-15

- (2) Wear and damage of pressure plate

Thickness standard:

4 mm (0.157 in)

Wear limit: 3.8 mm (0.15 in)



Inspecting the Pressure Plate

LAR4-19

- (3) Wear, damage, burning, deformation and discoloration of clutch disc.

Wear and damage at serration

Thickness standard:

2.6 mm (0.102 in)

Wear limit: 2.4 mm (0.094 in)



Inspecting the Clutch Disc

LAR4-17

- (4) Wear, damage, burning, deformation and discoloration of clutch plate

Thickness standard:

1.6 mm (0.063 in)

Wear limit: 1.4 mm (0.055 in)



Inspecting the Clutch Plate

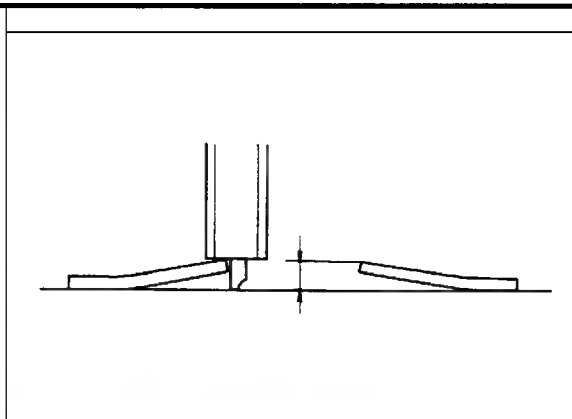
LAR4-18

- (5) Inspect the clutch camber plate for damage, deformation, discoloration and bow.

Place the camber plate on a surface plate and measure the height at the inner circumference.

Bow standard: 2.6 mm (0.102 in)

Wear limit: 2.2 mm (0.087 in)



Inspecting the Camber Plate

LAOS438

- (6) Damage, deformation and fatigue of clutch return spring

Free length: 51 mm
(2.008 in)

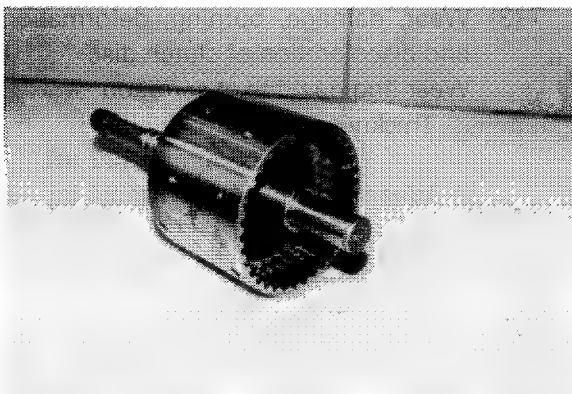
Free length limit: 46 mm (1.81 in)



Inspecting the Clutch Return Spring

LAR4-20

- (7) Crack and damage of clutch drum



Inspecting the Clutch Drum

LAR4-6

- (8) Clutch shaft inspection

- ① Damage on shaft
- ② Clogged oil path
- ③ Damage at spline
- ④ Measure the seal ring thrust clearance.

Clearance limit: 0.3 mm
(0.0118 in)



Inspecting the Clearance

LAR5-8

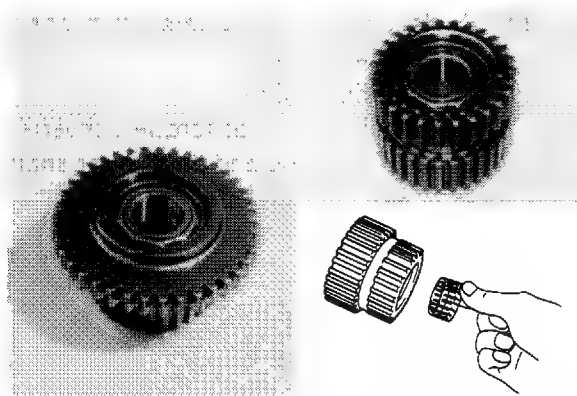
- (9) Piston and piston ring
- ① Crack and damage
 - ② Measure the clearance between the piston and piston ring.
- Clearance limit: 0.15 mm (0.0059in)**



Inspecting the Clearance

LAR4-22

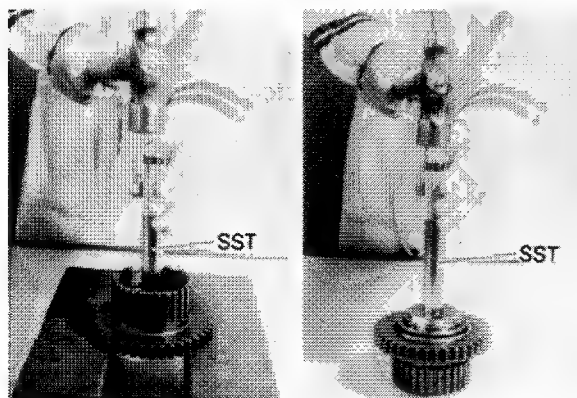
2. Inspect each clutch gear and bearing.
- (1) Crack and damage of each gear
 - (2) Damage and rotation of each bearing
- For reverse gear
- 4Y engine model ... Ball bearing**
4P engine model ... Needle bearing
- Replace the bearing of each clutch gear if it is found abnormal.



Inspecting the Clutch Gear

LAR5-22,24 LARS

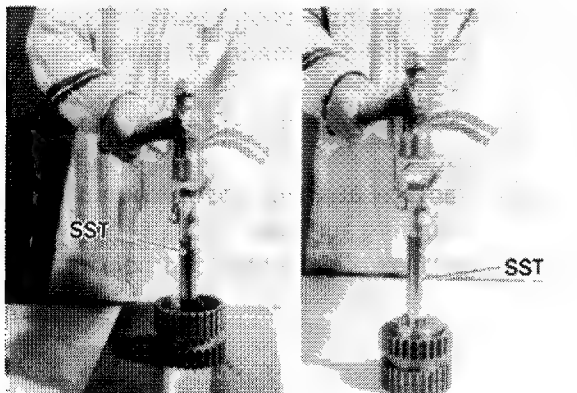
- (3) Forward clutch gear
SST 09608-30012



Replacing the Bearing (Forward)

LAR5-18,19

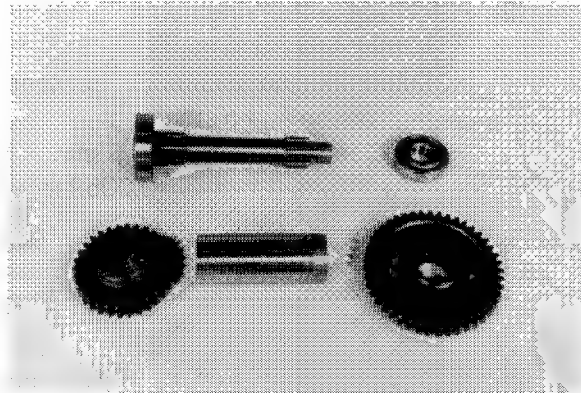
- (4) Reverse clutch gear
SST 09608-30012



Replacing the Bearing (Reverse)

LAR5-31,30

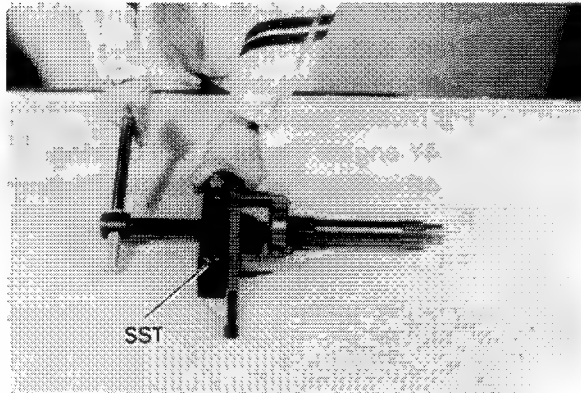
3. Inspect countergear related parts.
 - (1) Crack and damage of gear
 - (2) Damage of countershaft
 - (3) Damage and rotation of bearing
 - (4) Damage of spacer
 Replace the bearing when it is found abnormal.



Inspecting the Countergear Related Parts

LAR6-23

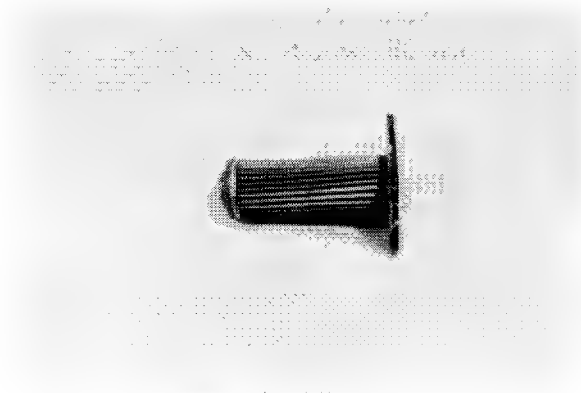
- (5) Replacement of countershaft bearing (on differential side)
SST 09950-20017
For installation, coat torque converter oil on the bearing and drive in the shaft vertically.



Removing the Bearing

LAR6-21

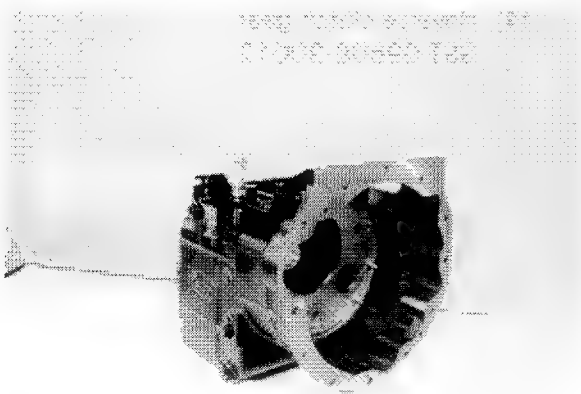
4. Inspect the oil filter
 - (1) Clogging by dirt
 - (2) Damage and deformation of wire net



Inspecting the Oil Filter

LAR6-26

5. Inspect the transmission case.
 - (1) Crack and damage of transmission case.
 - (2) Crack and damage at bearing inserting portion
 - (3) Damage at valve and oil pump case mounting surfaces
 - (4) Damage of each threaded hole



Inspecting the Transmission Case

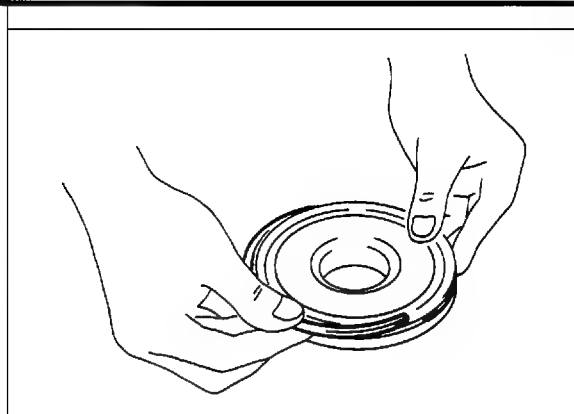
LAR11-4

ASSEMBLY

Caution:

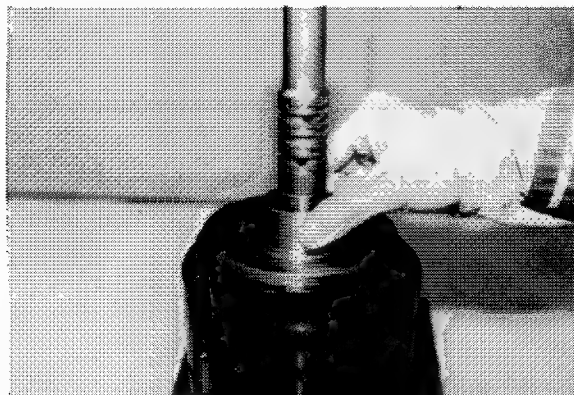
Clean each part thoroughly in the washing fluid and coat torque converter sufficiently before assembly.

1. Assembly the clutch drum ASSY.
 - (1) Piston ring
 - (2) Apply torque converter oil in the ring groove on the piston and turn the piston ring a few times.
 - (3) Insert the piston into the clutch drum.



Installing the Piston Ring

LAR546



Piston Assembly (1)

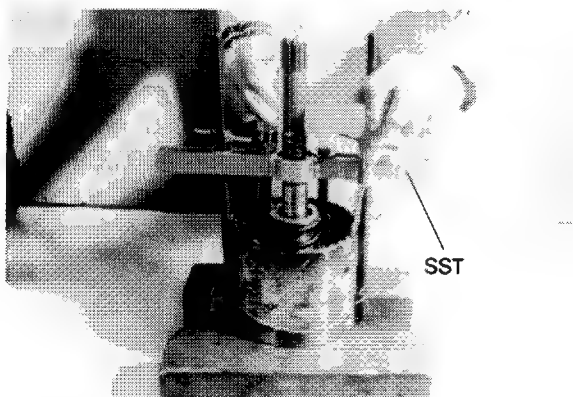
LAR3-33

- (4) Set the clutch return spring, spring retainer and snap ring on top of the piston.
- (5) Set the SST and slightly tighten the nut to compress the spring a little.
SST 09220-22000-71

Reference:

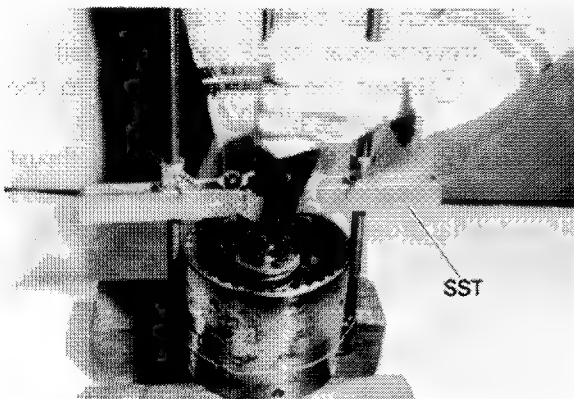
When tightening the SST nut, it is recommended to tie the SST to the drum with a wire to prevent it from coming off.

- (6) Use a screwdriver to push the piston ring while housing the piston.
- (7) Tighten the SST nut further to compress the spring to the position allowing snap ring setting.
- (8) Use a snap ring plier to install the snap ring.



Piston Assembly (2)

LAR5-35



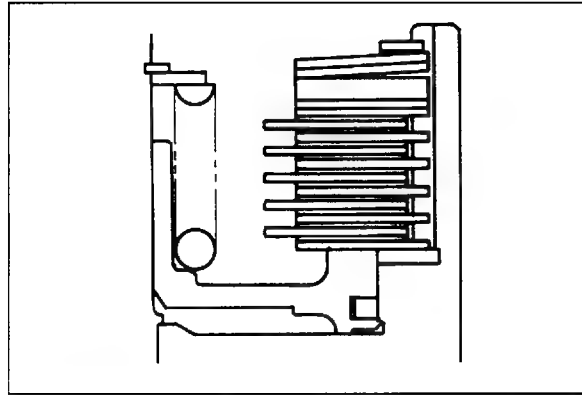
Installing the Snap Ring

LAR6-2

- (9) Coat torque converter oil sufficiently on the clutch plate and clutch disc, and install them in the clutch drum.
- (10) Install the pressure plate.
- (11) Install the camber plates (2 pcs.).

Caution:

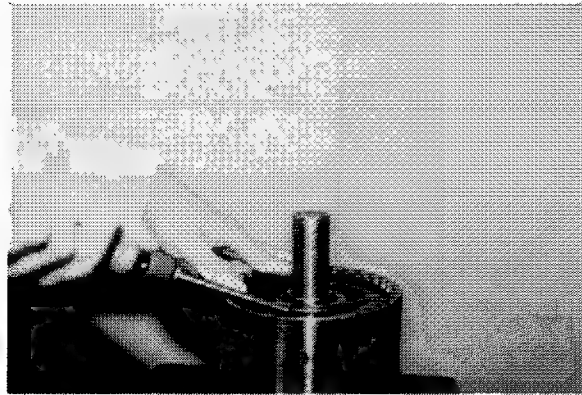
Pay attention to the front and rear faces for correct positioning. The collar position is not specified.



Installing the Clutch Plate, etc.

LARS47

- (12) Install the snap ring.



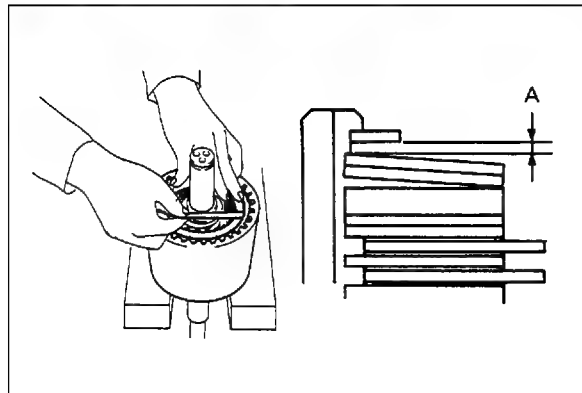
Installing the Snap Ring

LAR6-14

- (13) Measure clearance (A) between the snap ring and camber plate with a thickness gauge.

Clearance A = 1.0 — 1.5 mm
(0.394 — 0.059 in)

If the clearance is not within the specified range, inspect each plate for wear and replace the worn plate.

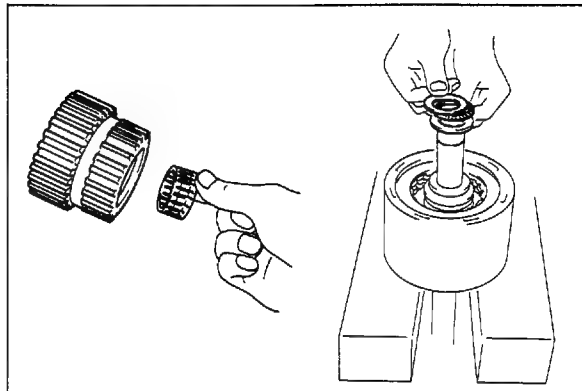


Measuring the Clearance

LARS48, 60

- (14) Clutch gear bearing installation
(reverse gear for 4P engine model)

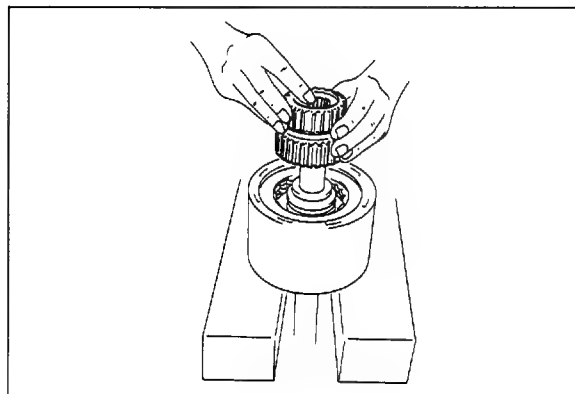
- ① Insert the needle bearing to the clutch gear.
- ② Install the thrust washer, thrust bearing and thrust washer in this order in the clutch drum.



Installing the Bearing

LARS45, 49

- ③ Match the clutch disc serration grooves.
- ④ Coat torque converter oil on the clutch gear and insert the gear from the upper side.
- ⑤ Install the thrust washer, thrust bearing and thrust washers (2 pcs.) in this order on top of the clutch gear.



Clutch Gear Assembly (1)

LARS61

(Clutch gear for 4Y engine model, and forward gear for 4P engine model)

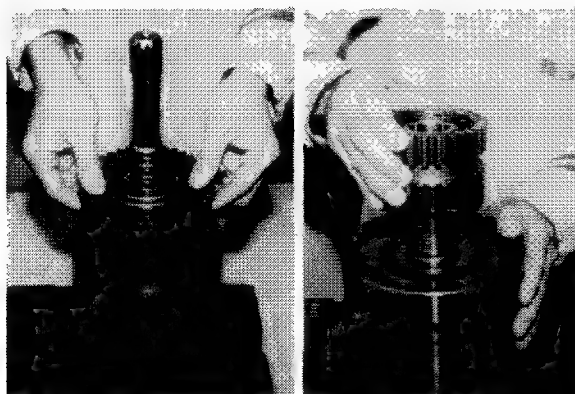
- ① Match the clutch disc serration grooves.
- ② After coating torque converter oil on the clutch gear, insert the gear from the upper side.
If the insertion becomes hard half-way, remove the gear once and match the clutch serration grooves again.

- ③ Spacer
@nap ring

(15) Seal ring

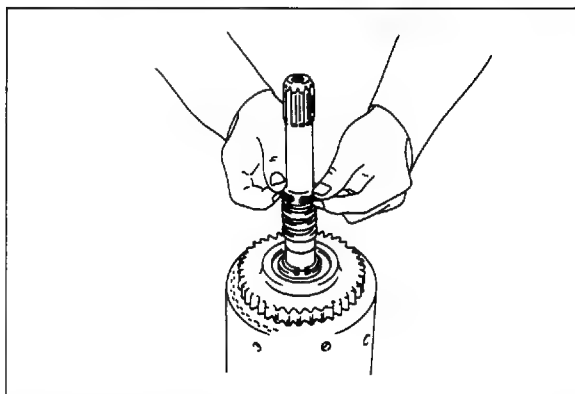
Caution:

- Do not expand the seal ring excessively.
- After installation, check the seal ring for no abnormality and coat torque converter oil.



Clutch Gear Assembly (2)

LAR6-16,17



Installing the Seal Ring

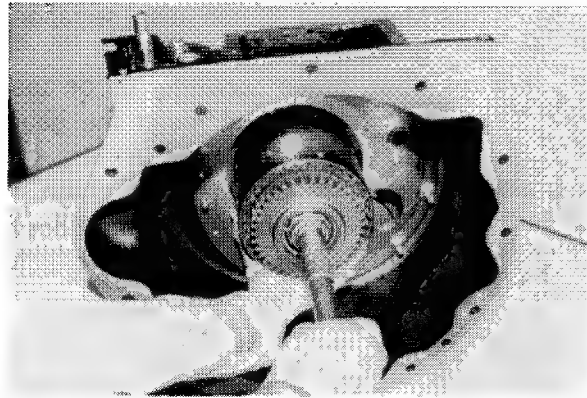
LARS51

Place the oil pipe in the transmission case.

Install the clutch drum ASSY to the transmission case.

Caution:

Insert the drum ASSY with the clutch shaft straight to the bearing, and tap the end of the shaft with a plastic hammer.



Installing the Clutch Drum ASSY

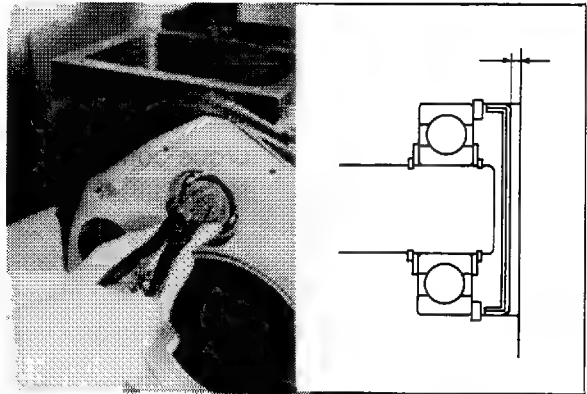
LAR11-12

Fit the spacer to the clutch shaft (on the differential side) and install the snap ring.

Drive in the seal plate.

Caution:

The seal plate surface shall be lower than the case surface.



Installing the Seal Plate

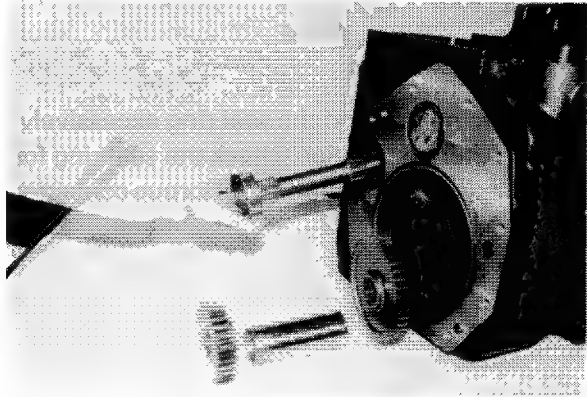
LARS62

6. Install the countergear related parts.

Caution:

Correctly install countergears No. 1 and No. 2 by referring to the memo on their directions prepared at the time of removal.

- (1) Countergears No. 1 and No. 2
- (2) Spacer
- (3) Countershaft w/bearing



Installing the Countergear Related Parts

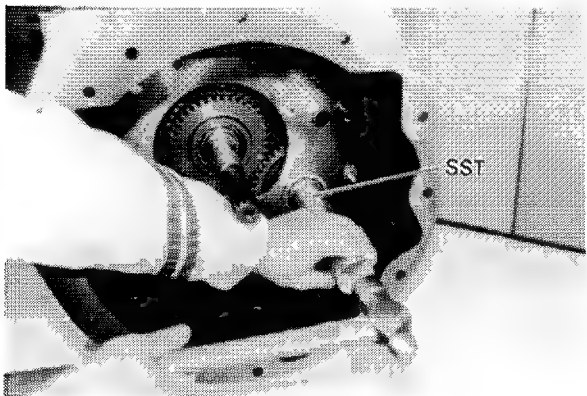
LAR2-18

- (4) Bearing (on torque converter side)
SST 09411-41800-71
- (5) Stopper plate and lock plate
- (6) Set bolts
- (7) Securely lock the lock plate.
- (8) Spacer
- (9) Snap rings (2 pcs.)

Drive in the seal plate.

Caution:

Same as in 5 above.



Installing the Bearing

LAR11-22

8. Install the oil pump case.

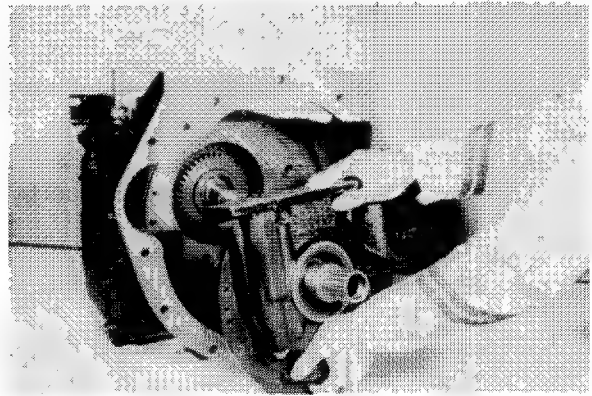
(1) Oil pump case

Caution:

- Clean the mating surfaces.
- The O-ring shall be set without fail, with rubber grease coated on its surface.

(2) Set bolts and nuts

T = 1.9 ~ 2.5 kg-m
(13.7 ~ 18.0 ft-lb)



Installing the Oil Pump Case

LAR11-23

9. Install the differential carrier ASSY.

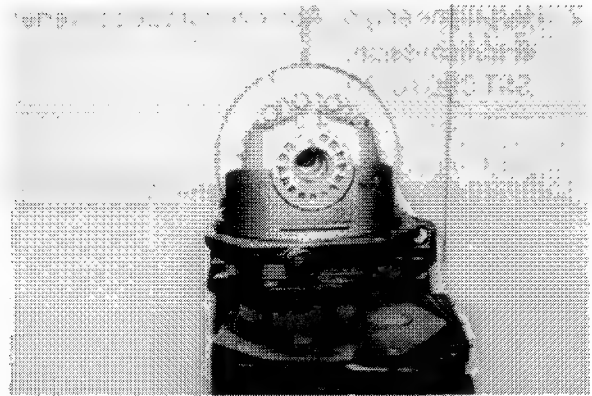
Caution:

- Clean the mating surfaces.
- Coat rubber grease on the O-ring.

(1) Differential carrier ASSY

(2) Set bolts

T = 6.9 ~ 8.0 kg-m
(49.9 ~ 57.8 ft-lb)



Installing the Differential Carrier ASSY

LAR1-33

10. Install the upper cover.

11. Install the inching lever and selector lever.

12. Install the control valve ASSY.

(1) Accumulator related parts

(2) Control valve ASSY

(3) Set bolt

T = 1.9 ~ 2.5 kg-m
(13.7 ~ 18.0 ft-lb)

13. Install the oil filter ASSY.



Control Valve ASSY

LAR1-18

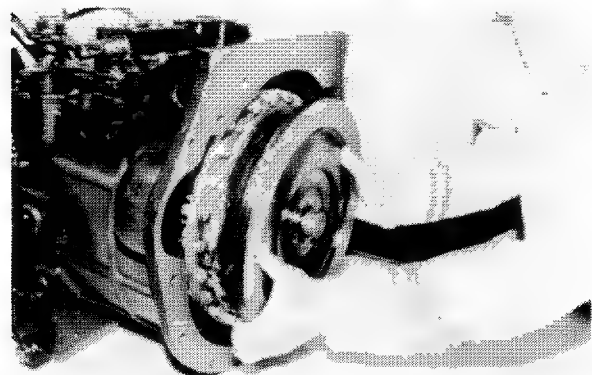
14. Install the torque converter ASSY.

(1) Install the torque converter ASSY on the stator shaft.

(2) Assembly while rotating the torque converter so that the pump impeller extension pawl fits into the pump gear groove.

Caution:

There is no stopper to prevent the torque converter ASSY from coming off. Therefore, carefully operate when transporting the case so as not to let the torque converter case ASSY fall.

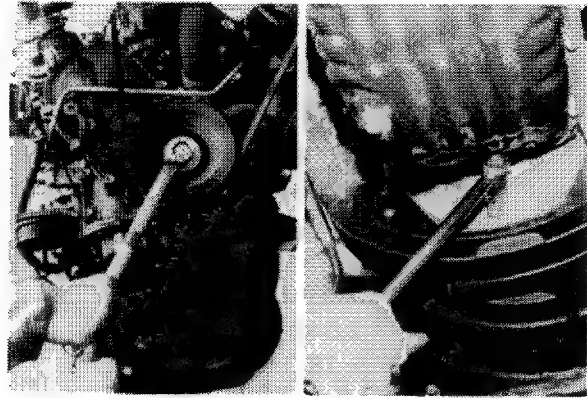


Installing the Torque Converter ASSY

LAR1-16

INSTALLATION

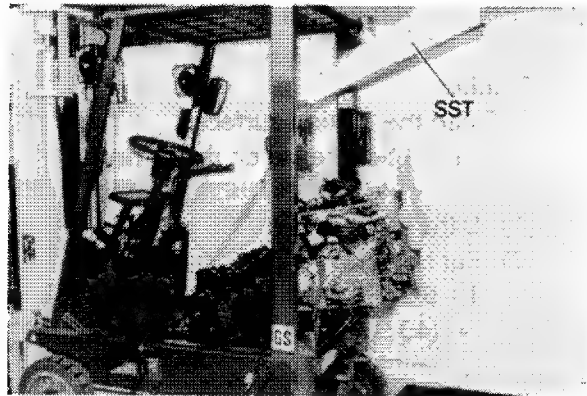
1. Install the torque converter & transmission to the engine.
 - (1) Torque converter housing set bolts
 - (2) Connect the drive plate and flywheel by tightening the set bolts (6 pcs.).
SST 09010-20111-71



Tightening the Drive Plate Set Bolts

LAR27-35,36

Install the engine ASSY w/torque converter & transmission.
SST 09010-20111-71

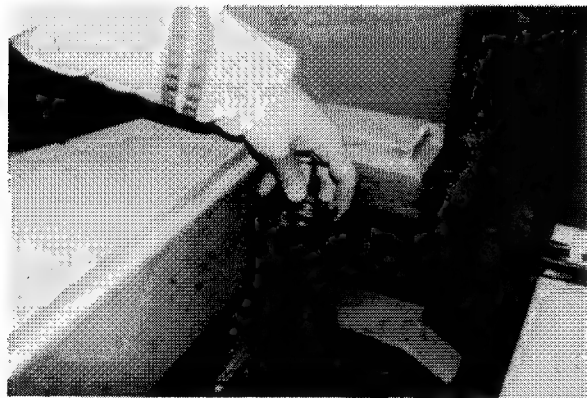


Installing the Engine W/Torconmission

LAR27-31

Jobs after installing engine ASSY w/torque converter & transmission

- (1) Coolant filling
Coolant amount:
11.5 ℓ (3.04 US gal)
- (2) Torque converter oil supply
Oil amount: 9.5 ℓ (2.51 US gal)
- (3) Differential oil supply
Oil amount: 5.0 ℓ (1.32 US gal)
- (4) Engine tune-up
See page 1-9.



Supplying Coolant

LAR39-19

MEASUREMENT & TEST

The measurement and test results shall be judged according to the troubleshooting in this section and the necessary action shall be taken.

1. Oil level measurement

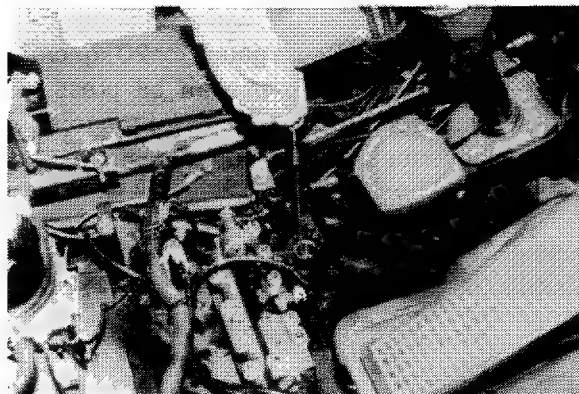
- (1) Keep the vehicle in horizontal state, set the lever at the neutral position, and idle the engine.
- (2) After warming up, idle the engine and measure the oil level with the level gauge.

Oil pressure measurement

- (1) After warming up the engine, measure the idling speed and no-load static maximum speed.

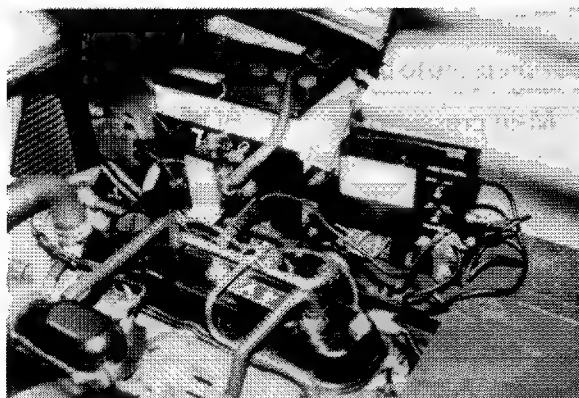
Caution:

If the measured speed does not satisfy the standard, make adjustment by referring to the Engine time-up section.



Measuring the Engine Speed

LAR40-7

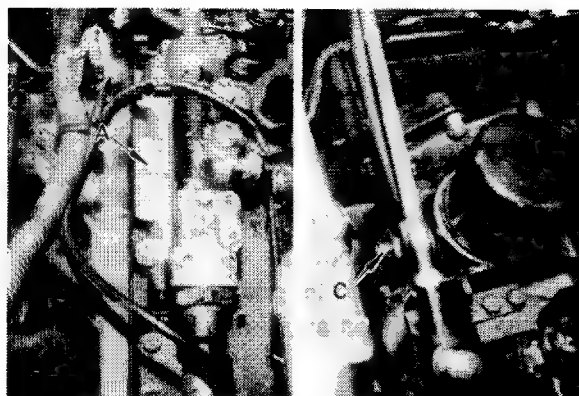


Measuring the Oil Level

LAR40-29

Engine	Idling speed	No-load static maximum speed
4Y	650 $^{+50}_{0}$ rpm	2450 ± 50 rpm
4P	650 $^{+50}_{-0}$ rpm	2900 $+50$ rpm

- (2) Stop the engine after adjusting the speed.
- (3) Jack up the front axle until front tires leave the ground.
- (4) Remove the toeboard and set the oil pressure gauge.
- (5) Start the engine and set the shift lever to the neutral position to measure the main pressure (A) and outlet pressure (C).
- (6) Shift the shift lever to the forward and reverse positions, and measure the clutch operating pressure (B).



Oil Pressure Gauge Setting Position

LAR40-4,17

Caution:

- Use an oil pressure gauge for 20 kg/cm². It is desirable to use an oil pressure gauge for about 5 kg/cm² for the torque converter pressure (outlet pressure).



Oil Pressure Gauge Setting Position

LAR40-5

Oil pressure to be measured		Vehicle models	All models
Main pressure (A) kg/cm ² (psi)	At idling speed		6.0 ~ 10.0 (85.2 ~ 142.2)
	At no-load static maximum speed		8.0 ~ 12.0 (113.6 ~ 170.4)
Clutch pressure (B) kg/cm ² (psi)	At idling speed		6.0 ~ 10.0 (85.2 ~ 142.2)
	At no-load static maximum speed		8.0 ~ 12.0 (113.6 ~ 170.4)
Outlet pressure (C) kg/cm ² (psi)	At no-load static maximum speed		0.5 ~ 3.5 (7.1 ~ 49.7)

3. Stall test

- (1) Securely check the front and rear wheels, load a cargo near the maximum allowable load, and fully apply the parking brake.

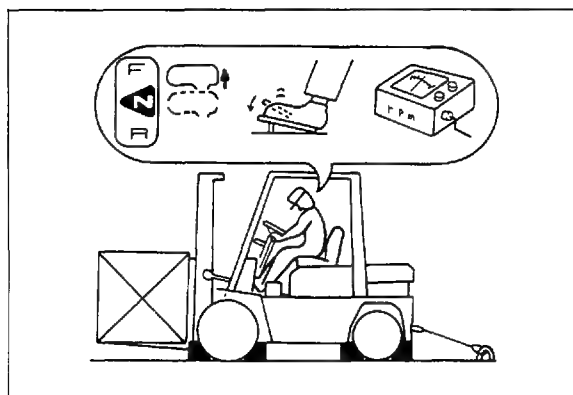
Caution:

The vehicle must be kept in perfectly stopped state and lash with a wire to make the vehicle immovable for safety.

- (2) Warm up the engine and measure the idling speed and no-load static maximum speed.
- (3) Check the engine output by the maximum speed when the engine is loaded.

[Method]

After adjusting the no-load static maximum speed adjustment, operate the tilt lever to the forward or backward tilt position and measure the maximum speed at full acceleration in the relief state.



Stall Test

LAOS321

[Judgment]

When the engine speed drops excessively, tune up the engine by adjusting the air governor, etc., because the engine tune-up is insufficient. (Refer to the engine tune-up section.)

Drops by 150 to 300 rpm from the no-load static maximum speed

- * The drop is slightly greater than the above in an LPG engine model.

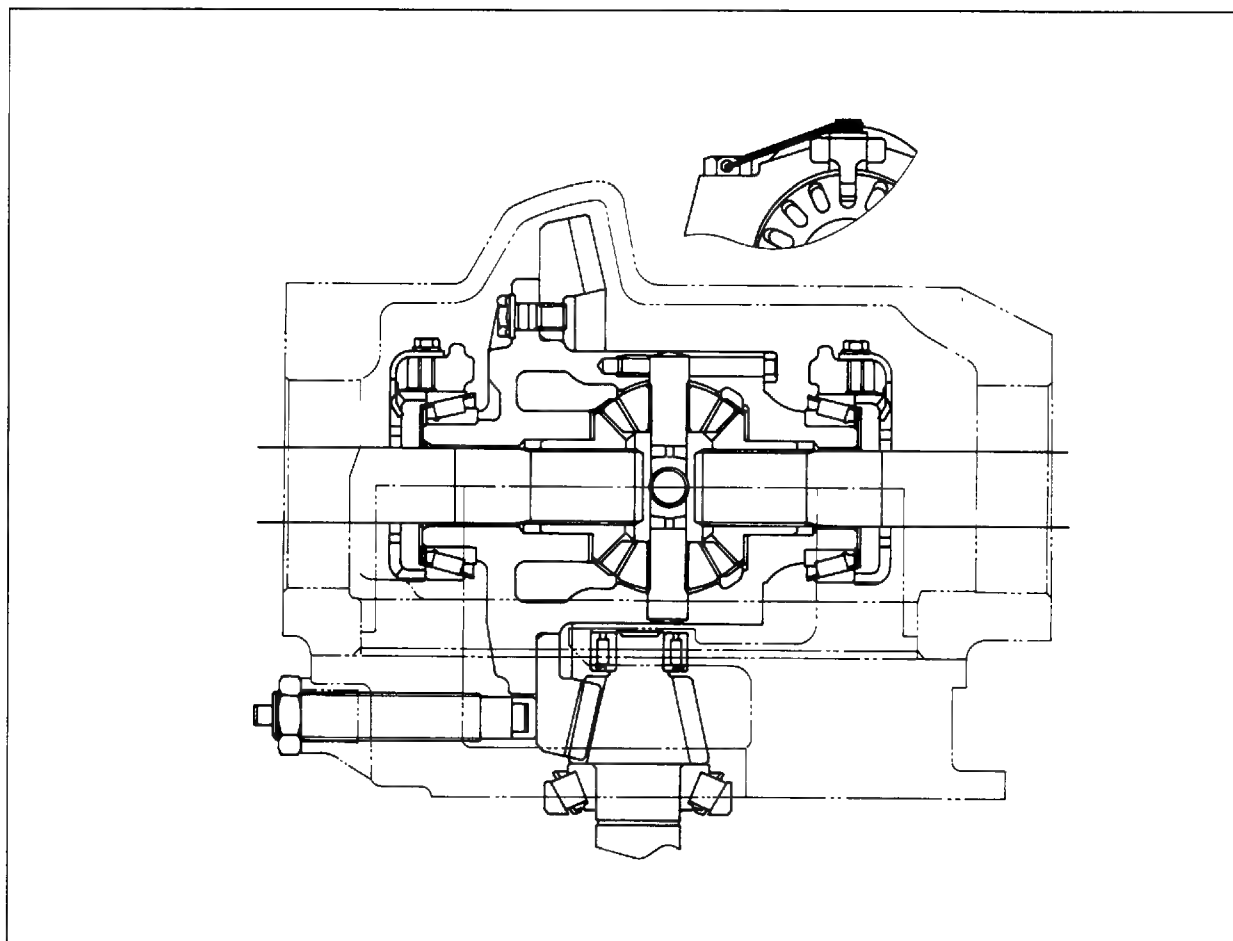
- (4) Start the engine. Set the shift lever to the forward or reverse position and fully depress the accelerator lever. Measure the engine speed in this state after it is stabilized (stall speed).

Engine	Stall speed
4Y	1850 rpm
4P	2050 rpm

DIFFERENTIAL

	Page
GENERAL	3-2
SPECIFICATIONS	3-2
COMPONENTS	3-3
DIFFERENTIAL ASSY	3-4
REMOVAL	3-4
DISASSEMBLY	3-4
INSPECTION	3-9
ASSEMBLY & ADJUSTMENT	3-13
INSTALLATION	3-22

GENERAL



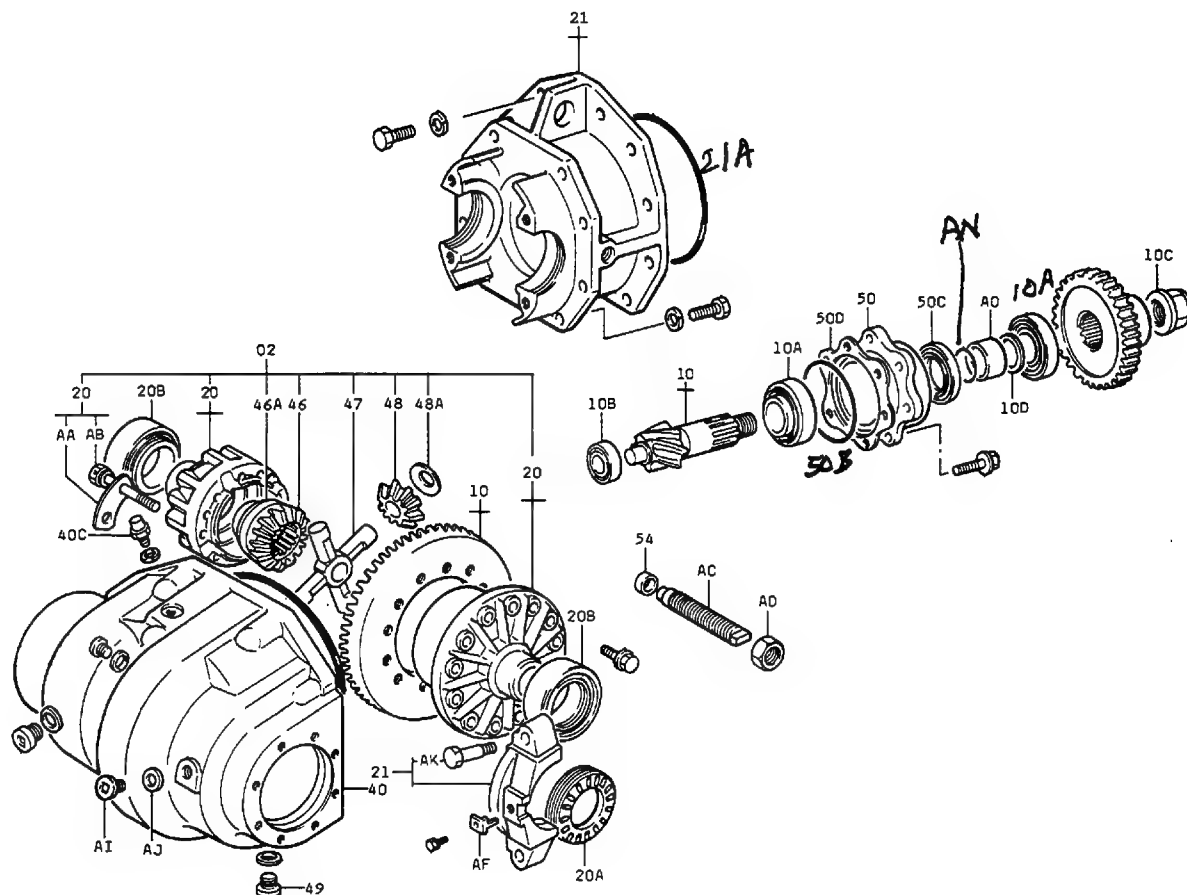
Differential Sectional View

LAOM45

SPECIFICATIONS

Item		4Y engine model	4P engine model
Differential case type		Banjo type	←
Differential reduction ratio		5.143	5.833
Number of teeth	Drive pinion	7	6
	Ring gear	36	35
Number of teeth x number of gears	Pinion gear	10 x 4	10 x 2
	Side gear	14 x 2	←
Differential oil capacity ℓ (US gal)		5 (1.32)	←

COMPONENTS



- 02 Case ASSY, differential
- 10 Ring gear & pinion set, differential
- 10A Bearing, drive pinion
- 10B Bearing, drive pinion pilot
- 10C Nut, lock
- 10D Shim, bearing preload adjust
- 20 Case SUB-ASSY, differential
- 20A Nut, adjusting
- 20B Bearing, differential case
- 21 Carrier SUB-ASSY, differential
- 40 Housing, differential
- 40C Plug, breather
- 46 Gear, side
- 46A Washer, side gear thrust
- 47 Spider
- 48 Pinion

- 48A Washer, pinion thrust
- 49 Plug, drain
- 50 Retainer, drive pinion bearing
- 50C Seal, oil
- 50D Shim, differential drive pinion
- 54 Cap, ring gear thrust screw
- AA Plate, bolt lock
- AB Bolt
- AC Screw, ring gear thrust
- AD Nut
- AF Lock, adjusting
- AI Plug
- AJ Gasket
- AK Bolt
- AO Spacer, bearing

21A O RING DIFF CARRIER

50B O RING

AN O RING

DIFFERENTIAL ASSY

REMOVAL

1. Remove the engine ASSY w/torque converter & transmission.

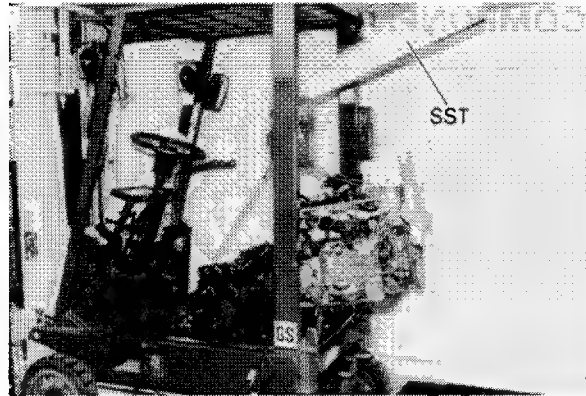
Reference:

Refer to the torque converter & transmission removal section.

Remove the drive plate set bolts.

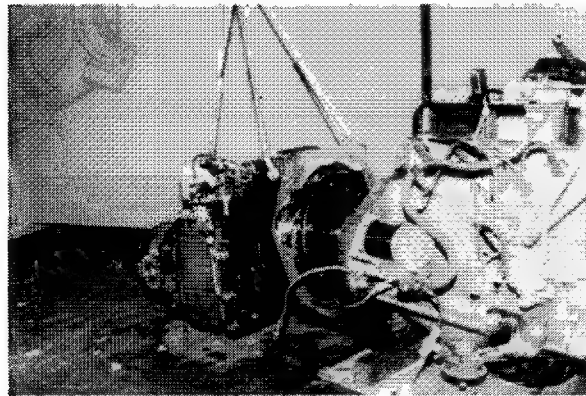
Separate the torque converter & transmission from the engine.

- (1) Torque converter housing set bolts
- (2) Torque converter & transmission separation



Removing the Engine W/Torque Converter & Transmission

LAR27-31



Separating the Torque Converter & Transmission

LAR24-36

4. Remove the differential carrier ASSY
 - (1) Set bolts
 - (2) Differential carrier ASSY

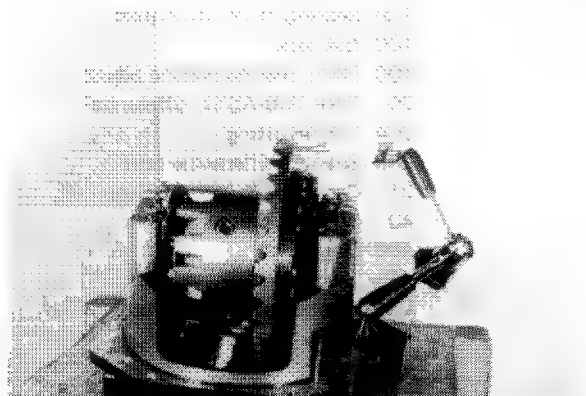


Removing the Differential Carrier ASSY

LAR11-29

DISASSEMBLY

1. Ring gear rear face runout measurement
 - (1) Place the differential ASSY to face upward and support it in stable state with wooden blocked under it.
 - (2) Use a dial gauge and measure the rear face runout of the ring gear.
Runout limit: 0.1 mm (0.004 in)

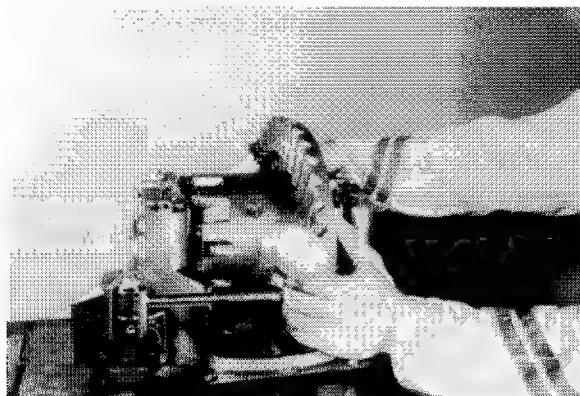


Measuring the Ring Gear Rear Face Runout

LAR11-33

Use a dial gauge and measure the ring gear backlash.

Backlash: 0.2 — 0.3 mm
(0.008— 0.012 in)



Measuring the Backlash

LAR11-36

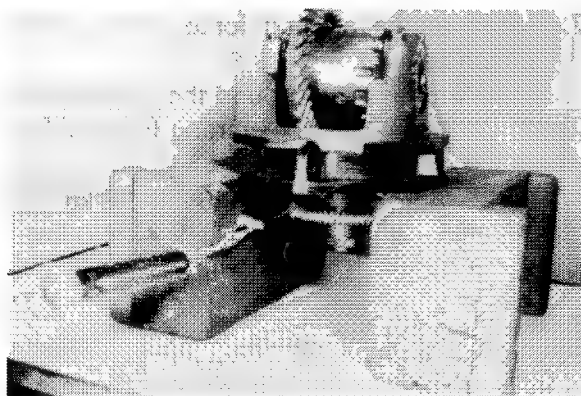
Side bearing starting force measurement

- (1) Wind a string around the output gear, and measure the starting force with a spring scale.

Starting force: 15.7— 18.8kg
(34.5 — 41.4 lbs)

Reference:

The value indicated by the spring scale is the resultant force combined with the pinion bearing preload.

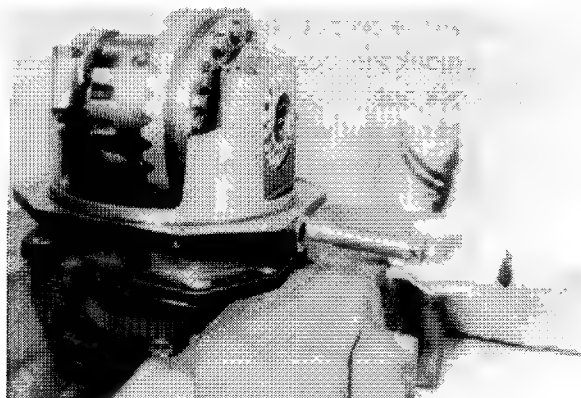


Measuring the Bearing Starting Force

LAR16-22

Remove the thrust screw w/cap.

- (1) Loosen the lock nut, and remove the thrust screw w/cap.



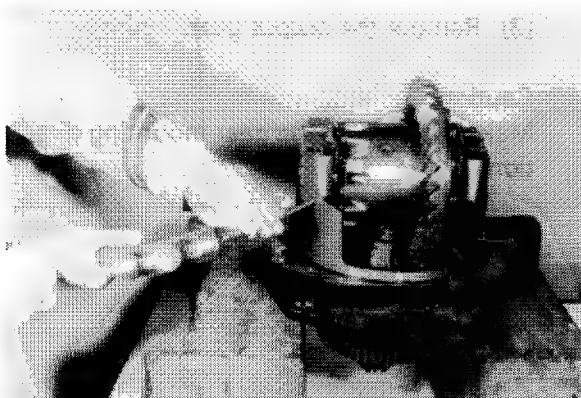
Removing the Thrust Screw

LAR12-7

Punch a match mark on the transmission and bearing cap.

Important:

Since the case and bearing cap are integrally machined to provide no interchangeability between LH and RH, always punch the match mark for reassembly at the same position.

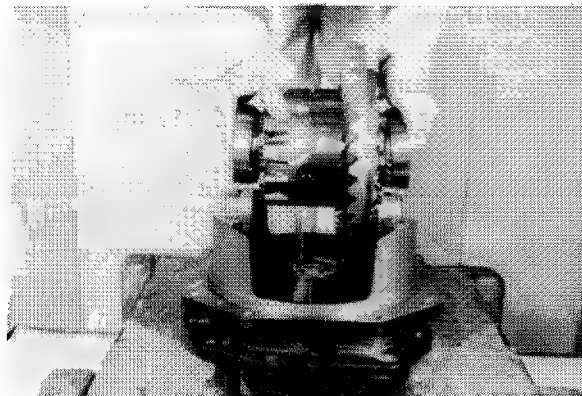


Punching the Match Mark

LAR12-10

Remove the differential case ASSY.

- (1) Lock wire
- (2) Lock bolt
- (3) Adjusting lock nut
- (4) Set bolts
- (5) Bearing cap
- (6) Adjusting nut
- (7) Differential case ASSY



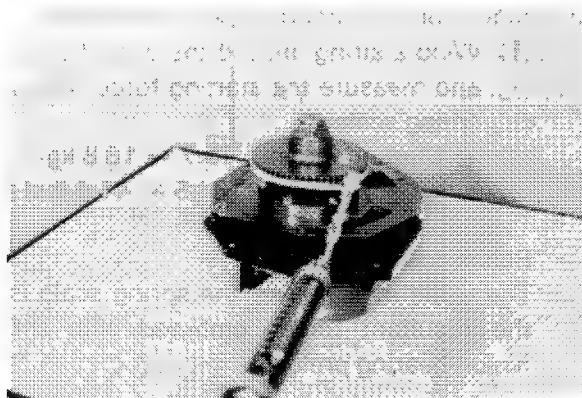
Removing the Differential Case ASSY

LAR16-9

Measure the starting force of the drive pinion bearing.

- (1) Wind a string around the output gear and measure the starting force with a spring scale.

Starting force: 9.6 — 11.8 kg
(21.1 — 26.0 lbs)



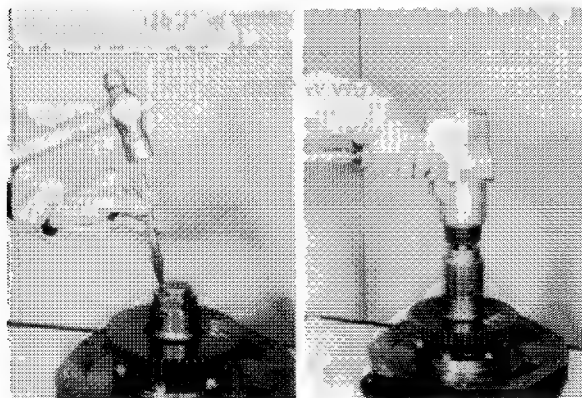
Measuring the Pinion Bearing Starting Force

LAR12-14

8. Remove the output gear.

- (1) Unlock the lock nut.
- (2) Lock nut

Lock nut width across flats:
50 mm (1.97 in)



Removing the Lock Nut

LAR12-13,15

- (3) Remove the output gear.

Caution:

Make a memo on the gear mounting directions.



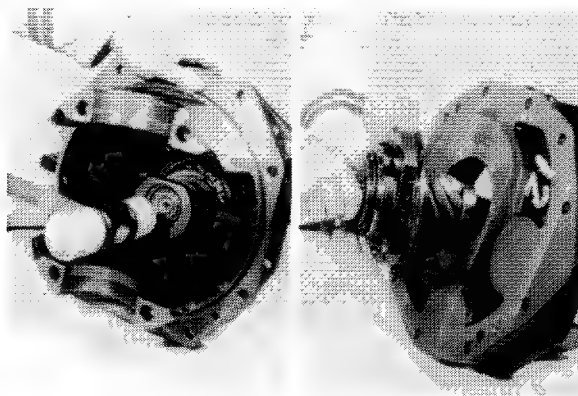
Removing the output Gear

LAR12-16

9. Remove the drive pinion w/retainer.
 - (1) Lock wire
 - (2) Set bolt
 - (3) Drive pinion w/retainer

Important:

Tap the pilot bearing at the end of the pinion with a plastic hammer.



Removing the Drive Pinion w/Retainer

LAR12-18,19

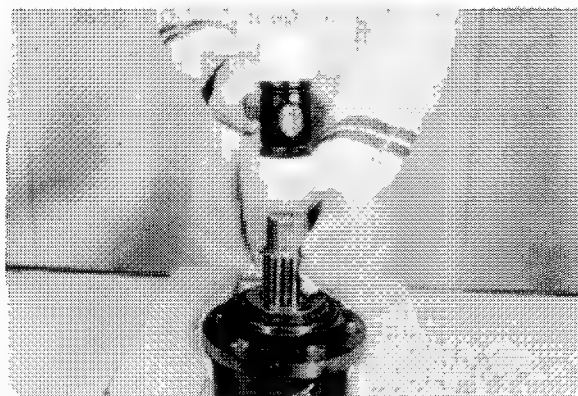
Caution:

Make a note on the shim thickness and the number of shims used.

10. Remove the drive pinion
 - (1) Drive pinion
 - (2) Shims

Caution:

Make a note on the shim thickness and the number of shims used.



Removing the Drive Pinion

LAR12-21

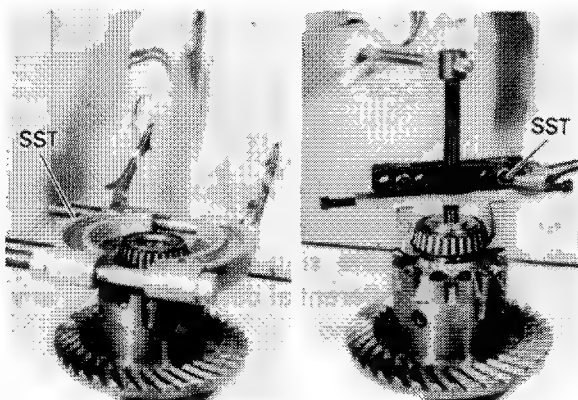
- (3) Spacer
 - (4) O-ring
11. Remove the side bearing.

SST 09420-23000-71

SST 09950-20017

Caution:

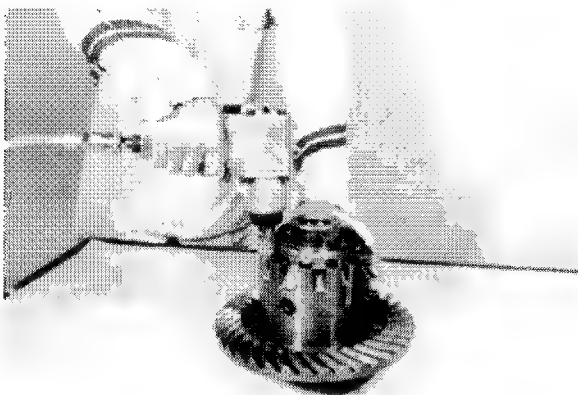
Remove the bearing only when the bearing is found defective.



Removing the Side Bearing

LAR13-15,17

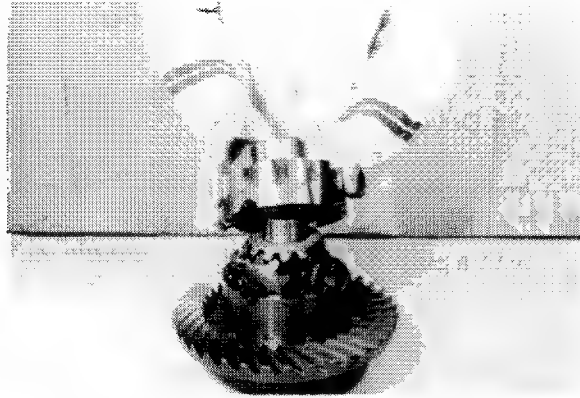
12. Remove the differential upper case.
 - (1) Unlock the lock plate.
 - (2) Set bolts



Removing the Set Bolts

LAR13-21

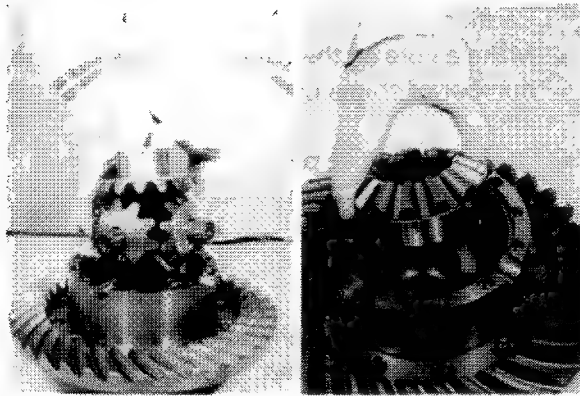
(3) Differential upper case



Removing the Differential Upper Case

LAR14-10

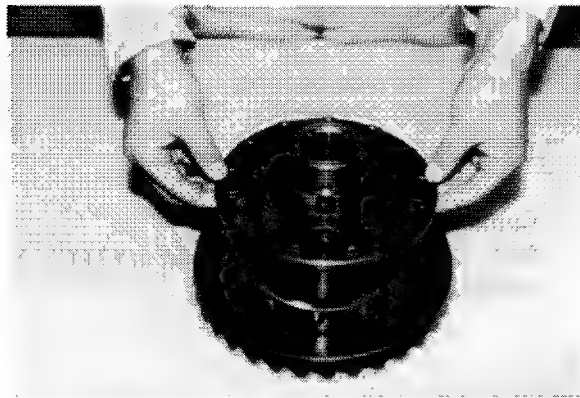
4. Remove the side gear, pinion gear and spider.
- (1) Side gear
 - (2) Pinion gear w/spider
 - (3) Side gear



Removing the Side and Pinion Gears

LAR14-13,14

5. Remove the ring gear.
- (1) Set bolt
 - (2) Ring gear
- Caution:
- Uniformly tap the ring gear rear face with a plastic hammer.
 - Remove the ring gear, drive pinion and/or differential case only when any defect is found.



Removing the Ring Gear

LAR41-30

INSPECTION

Caution

Before inspection, wash each part thoroughly in the washing fluid. Inspect each item, and correct or replace any part which is found defective.

1. Drive pinion and ring gear inspection
 - (1) Damage and wear of tooth surfaces
 - (2) Damage at pinion spline portion
 - (3) Damage of pinion threaded portion
 - (4) Damage and rotation of bearing

Caution:

Always replace the drive pinion and ring gear as a set when either of them is defective.

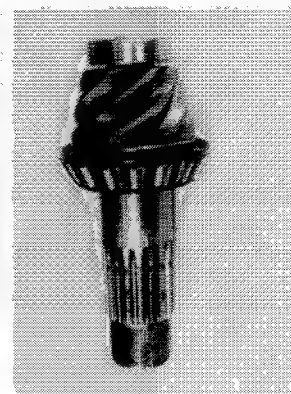
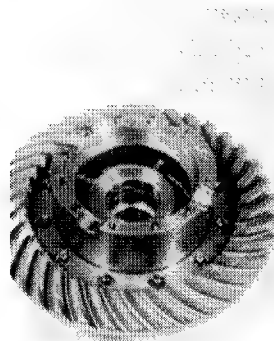
- (5) Wear, damage, rotation and abnormal noise of pilot bearing
Replace the bearing when it is found defective.

- ① Taper roller bearing replacement
SST 09950-20017
SST 09370-20270-7 1
- ② Pilot bearing replacement
SST 09950-20017

- ③ Pilot bearing installation
SST 09608-30012

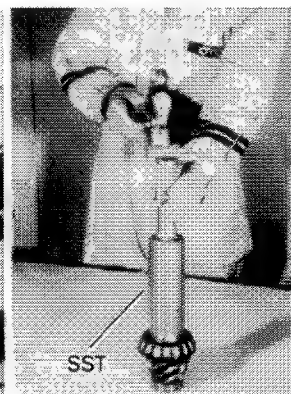
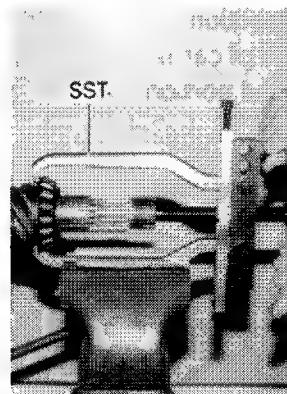
Caution:

After installing the pilot bearing, use a chisel and stake three places at the end of the drive pinion.



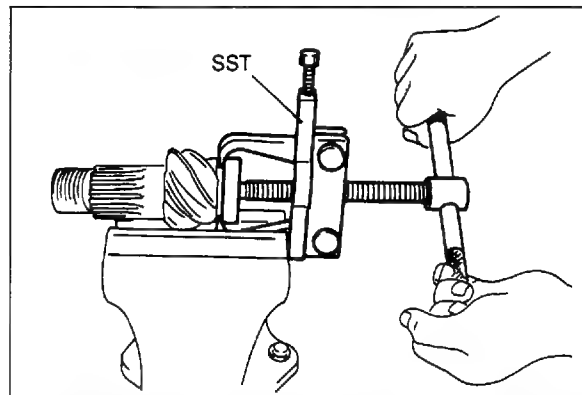
Inspecting the Pinion and Ring Gears

LAR14-16,12-35



Replacing the Taper Roller Bearing

LAR12-29,30



Replacing the Pilot Bearing

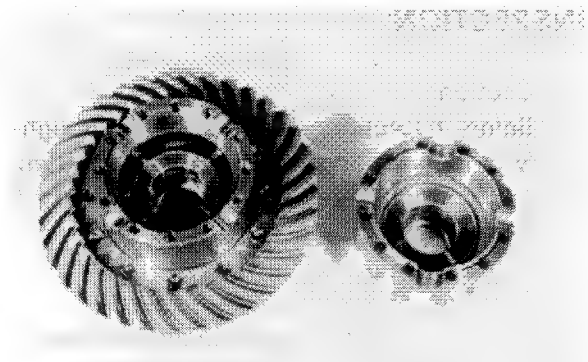
LA071-13



Installing the Pilot Bearing

LA066-26,27

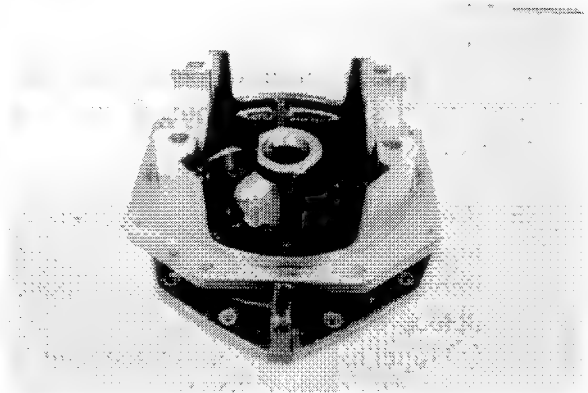
2. Differential case inspection
 - (1) Crack and damage of case
 - (2) Damage of set bolt threads



Inspecting the Differential Case

LAR14-17

3. Differential carrier inspection
 - (1) Crack and damage of carrier
 - (2) Damage of threaded portion

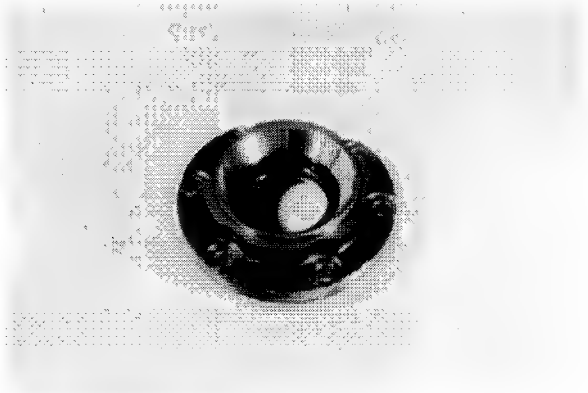


Inspecting the Carrier

LAR15-12

Bearing retainer inspection

- (1) Crack, damage and formation of retainer
- (2) Damage and deformation of bearing outer race
- (3) Damage of oil seal
Replace the oil seal or outer race when it is found defective.



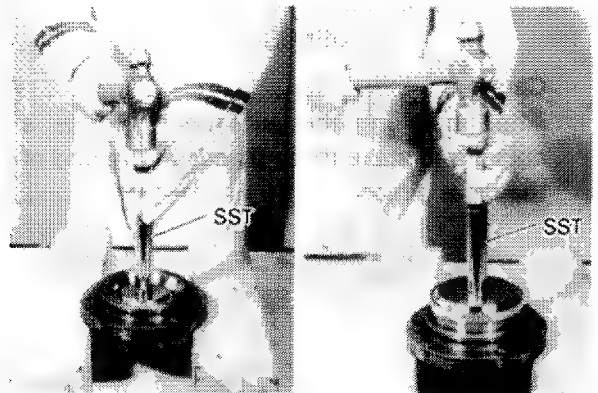
Inspecting the Retainer

LAR12-34

- (4) Oil seal and outer race replacement
SST 09608-35014

Caution:

Apply a thin coat of grease on the outside of the oil seal or outer race before installation. If it is inclined, start from the first again without trying forced driving in.



Replacing the Oil Seal or Bearing

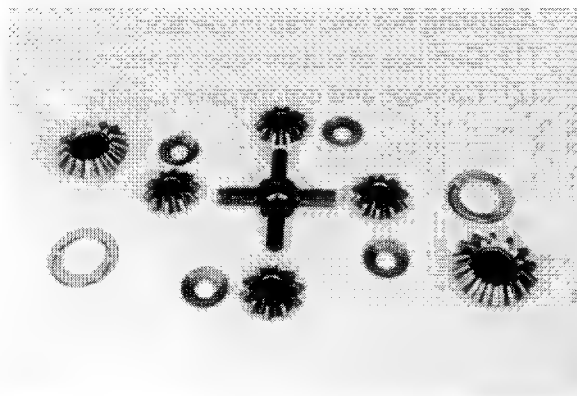
LAR13-3.7

5. Differential gear inspection

(1) Damage wear and crack of gear

Important:

Judge wear of the side gear, pinion and thrust washer by inspecting the backlash.



Inspecting the Differential Gear

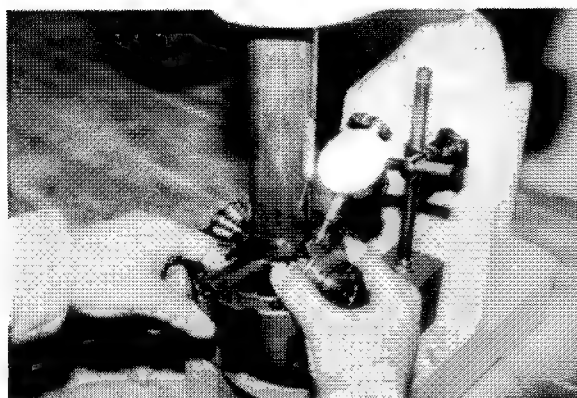
LAR14-19

(2) Use a hand press and measure the differential gear backlash.

Backlash: 0.2 — 0.3 mm
(0.008 — 0.012 in)

Caution:

Install the pinion and thrust washer to the spider, and the side gear and thrust washer to the case. Measure the backlash when the differential gear is fully pushed to the thrust washer side.



Measuring the Backlash

LA071-25

(3) Use a micrometer and vernier calipers and inspect the spider for wear or damage.

Outside diameter standard:
22.00 mm (0.866 in)
Wear limit: 21.75 mm (0.856 in)



Inspecting the Spider

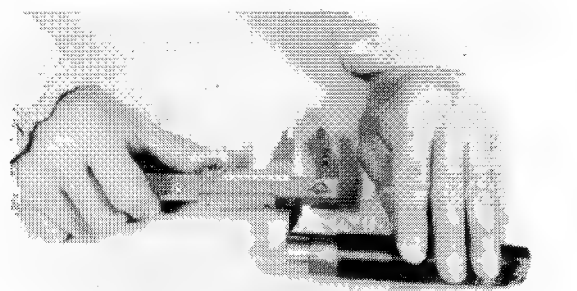
LAR14-23

6. Thrust screw cap inspection

(1) Damage and deformation of threaded portion

(2) Wear and damage of cap

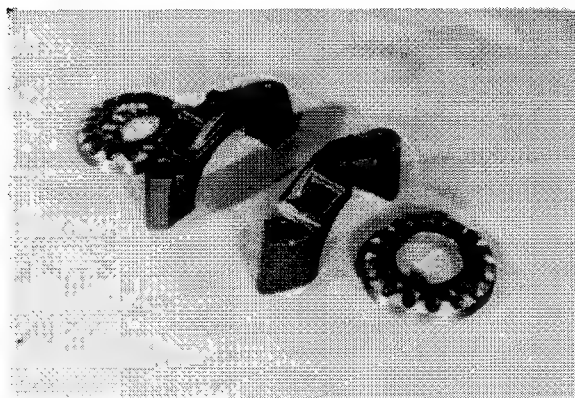
Thickness standard:
13.0 mm (0.512 in)
Wear limit: 12.2 mm (0.480 in)



Inspecting the Thrust Screw

LAR16-6

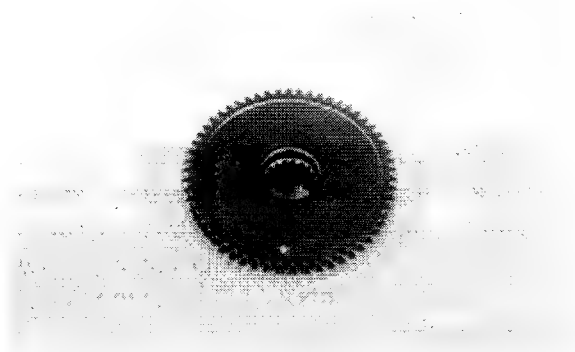
7. Adjusting nut and cap inspection
 - (1) Damage of nut threaded portion
 - (2) Damage and deformation of cap



Inspecting the Adjusting Nut

LAA17-21

8. Output gear inspection
 - (1) Damage and wear of tooth surfaces
 - (2) Damage at spline portion



Inspecting the Output Gear

LAR14-41

ASSEMBLY & ADJUSTMENT

Caution:

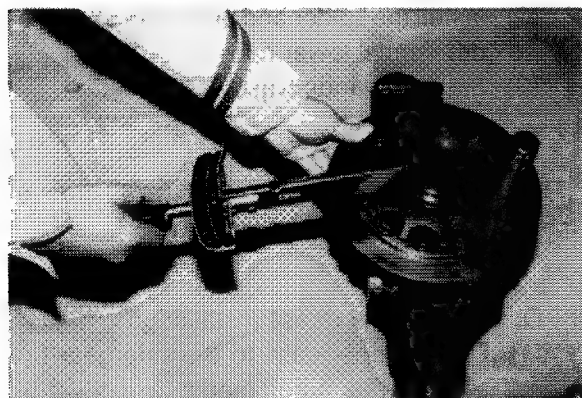
Always use new O-rings and gaskets for reassembly. The three following points are especially important for adjustment at the time of carrier assembly:

1. The bearing preload is given to prevent gear movement in the axial direction when loaded, and to prevent any play resulting from initial running in of the bearing.
2. The backlash is the play given between the ring gear and pinion in view of the tooth contact change caused by the deflection of the loaded gear.
3. Adjust the tooth contact correctly to prevent abnormal noise generation in both forward and reverse traveling.

Install the differential ring gear.

- (1) Set the ring gear to the differential lower case and coat Locktite #271 on the set bolt for assembly.

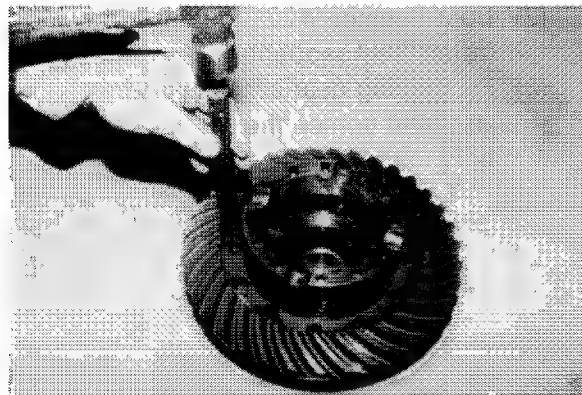
$T = 13 \sim 18 \text{ kg-m (94 \sim 130 ft-lb)}$



Installing the Ring Gear

LA069-31

- (2) use a chisel and caulk the end of the set bolt in a cross shape.

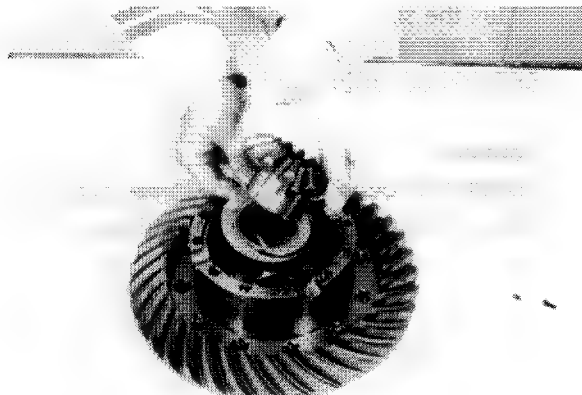


Caulking the End of Set Bolt

LA069-32

2. Install the side gear.

- (1) Coat hypoid gear oil on the thrust washer and insert the side gear with its oil groove facing upward.
- (2) Install the side gear and washer to the differential lower case.



Installing the Side Gear

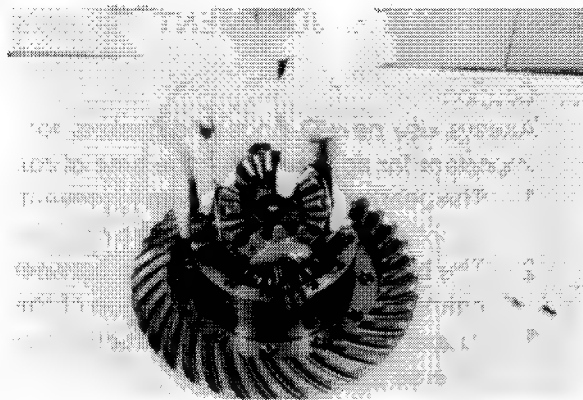
LAR14-32

Install the spider and pinion ASSY.

- (1) Coat hypoid gear oil on the thrust washer, and assemble the pinion and spider with alignment.

4Y engine vehicle: 4 pinions are used.

4P engine vehicle: 2 pinions are used.



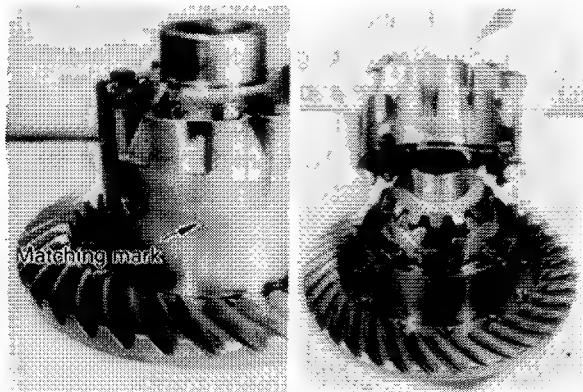
Installing the Spider and Pinion

LAR14-31

- (2) Install the spider and pinion ASSY to the differential lower case.
- (3) Side gear and thrust washer

Caution:

Install the thrust washer with its oil groove side facing the side gear tooth surface.



Installing the Differential Upper Case

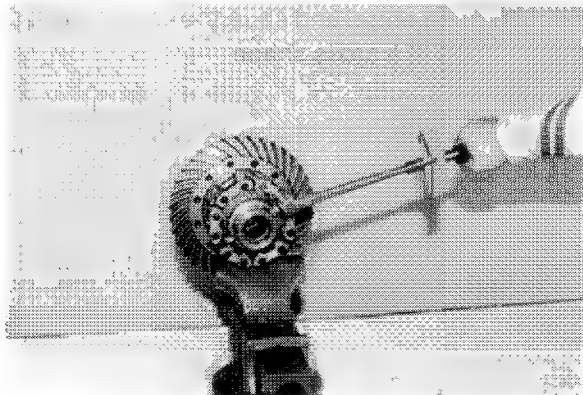
LAR14-33,13-22

Differential upper case installation

- (1) Fit the upper case to the side gear by aligning the match marks.

- (2) Coat Locktite #271 on set bolts and install them sequentially.
- (3) Fix the ring gear at the connector in a vise, and tighten the set bolts sequentially to the specified torque.

**T = 4.4 ~ 5.5 kg-cm
(31.8 ~ 39.7 ft-lb)**



Tightening the Set Bolts

LAR14-36

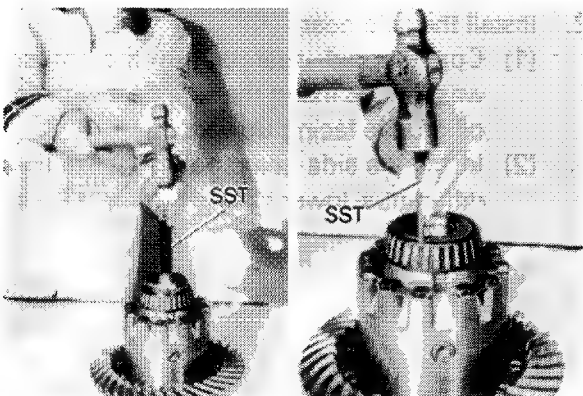
Install the side bearing.

SST 09608-3501 4

SST 09700-30200-7 1

Caution:

Install the bearing at the same position before disassembly in the correct direction.



Installing the Side Bearing

LAR14-39,40

Install the drive pinion

- (1) O-ring
- (2) Spacer

Caution:

Make the side with a radius on the inner circumference face downward.

- (3) Shim (same shim used before disassembly)

- (4) Retainer
- (5) Tapered bearing
SST 09370-20270-71

Adjust the drive pinion starting force.

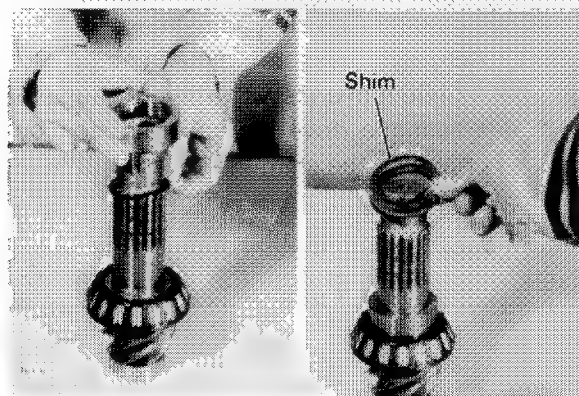
- (1) Output gear
- (2) Lock nut
T = 35 ~ 40 kg-m (253 ~ 289 ft-lb)
- (3) Starting force measurement
**Starting force: 13.8 ~ 16.9 kg
(30.4 ~ 37.18 lbs)**
- (4) If the starting force is not within the range specified above, disassemble and reassemble with shim adjustment, and measure the starting force again.

Caution:

If the stating force is lower than the specified value, decrease the shim thickness. Increase the shim thickness if the starting force is greater.

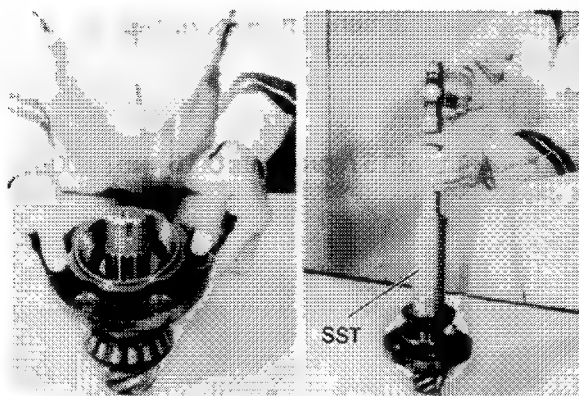
Shim part No.		Thickness
No. 1	32521-20570-71	0.10 mm (0.00394 in)
No. 2	32523-31940-71	0.13 mm (0.00512 in)
No. 3	32522-20570-71	0.15 mm (0.00591 in)
No. 4	32515-20570-71	0.20 mm (0.00787 in)
No. 5	32516-20570-71	0.50 mm (0.0197 in)

Remove the output gear again after the shim adjustment.



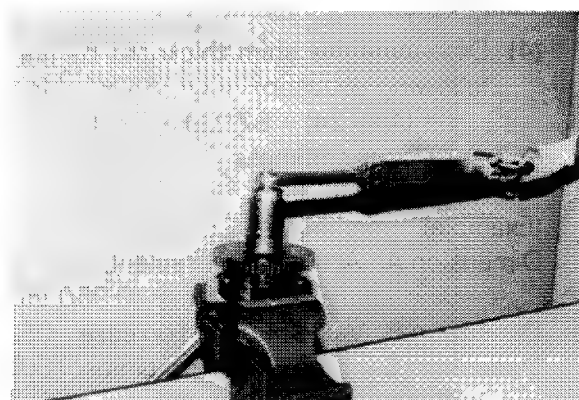
Installing the Spacer and Shim

LAR12-26,24



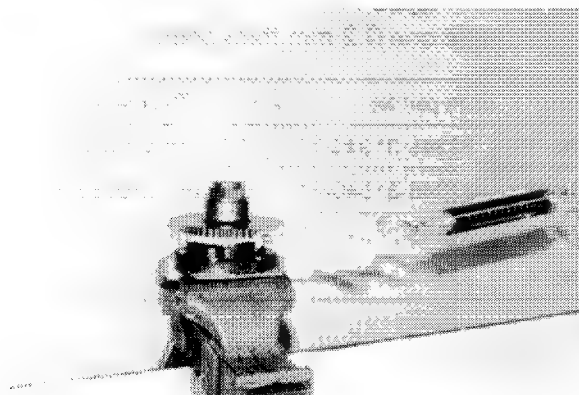
Installing the Retainer and Bearing

LAR13-12,14



Tightening Torque

LAR15-19

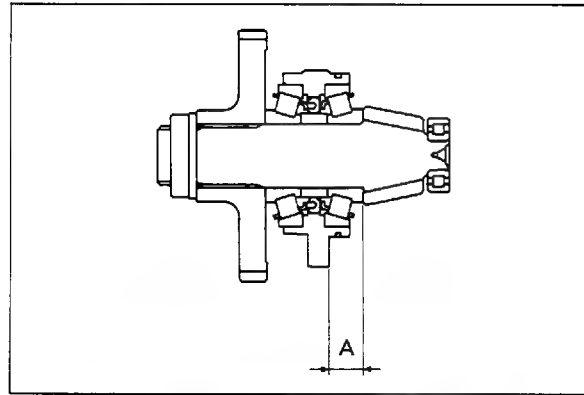


Measuring the Starting Force

LAR14-2

7. Drive pinion protrusion adjustment

- (1) Actually measure dimension A to 1/100 mm units with a height gauge to adjust the drive pinion protrusion by changing the shim thickness.



Dimension A

LAR50

- (2) Read dimension B punched on the transmission.

Important:

Punching of 15 represents 0.15 mm (0.0059 in).

- (3) Read dimension C written with an electric pen on the rear end of the drive pinion.

Important:

Read ±00 out of 000 ±00 written there.

- (4) Determine the shim thickness by the following equation:

$$t = (A - 24) + B/100 + C/100$$

t = shim thickness

(Example)

Dimension A Actual measurement:
24.14 mm (0.950 in)

Dimension B Value punched on case: 08

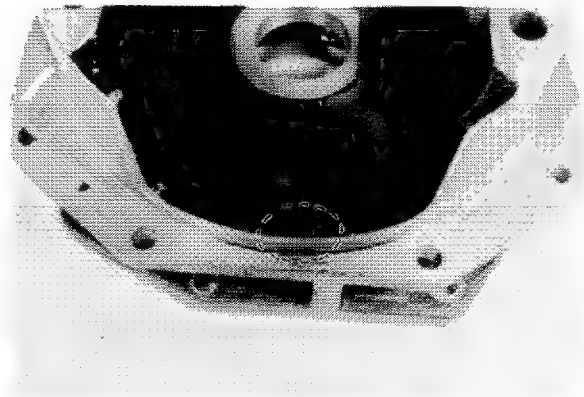
Dimension C Value written on pinion: 00

$$t = (24.14 - 24) + 8/100 + 0/100$$

$$= 0.22$$

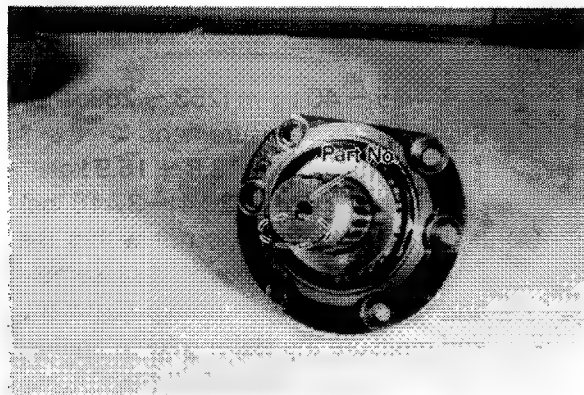
Use one 0.2 mm thick shim.

Shim part No.		Thickness
No. 1	32345-31940-71	0.1 mm (0.00394 in)
No. 2	32346-31940-71	0.15 mm (0.0059 in)
No. 3	32343-31940-71	0.20 mm (0.00787 in)
No. 4	32344-31940-71	0.40 mm (0.0157 in)



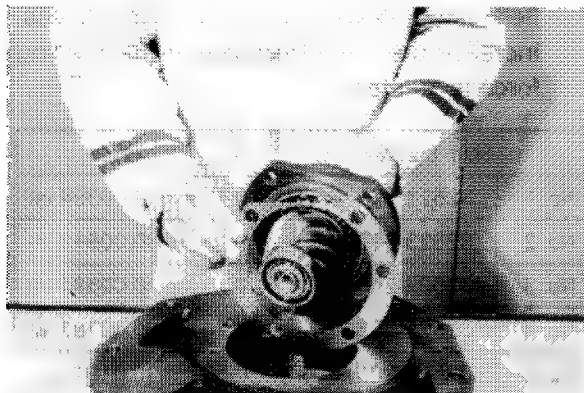
Dimension B Punching Position

LAR15-15



Dimension C Marking Position

LAR15-37



Shim Adjustment

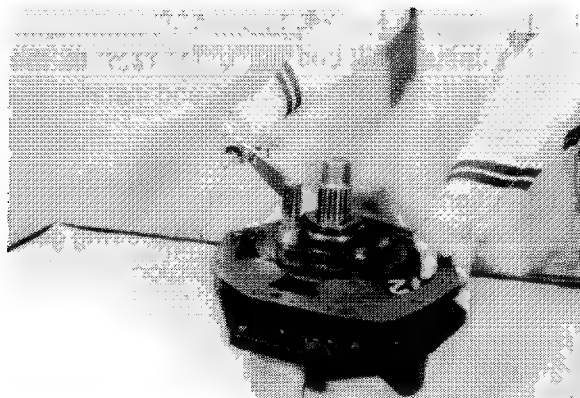
LAR15-29

8. Install the drive pinion w/retainer.
 (1) Set bolt
 $T = 7 \sim 8 \text{ kg-m (50.6} \sim 57.8 \text{ ft-lb)}$

Caution:

- Coat rubber grease on the O-ring.
- Coat Locktite #242 on the set bolt.

- (2) Lock with a wire.



Installing the Pinion w/Retainer

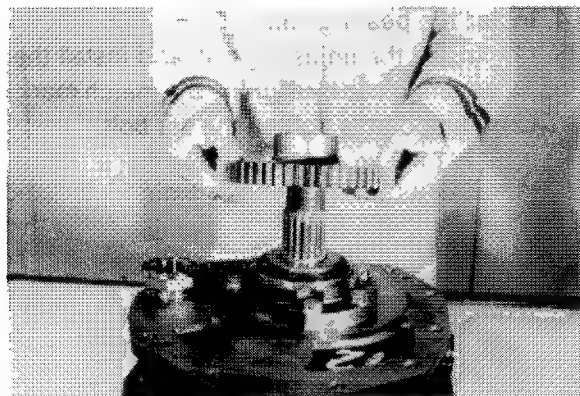
LAR15-39

9. Install the output gear.
 (1) Output gear

Caution:

The boss shall face upward (the transmission side).

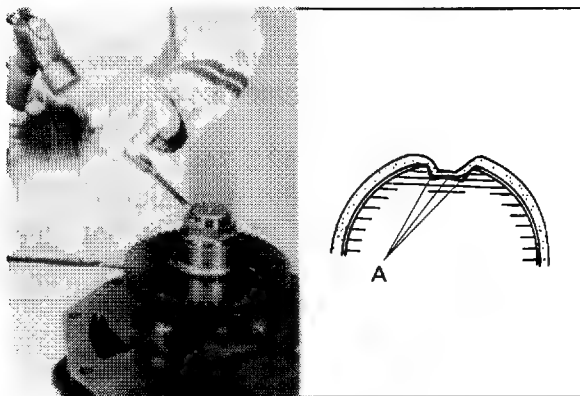
- (2) Lock nut
 $T = 35 \sim 40 \text{ kg-m (253} \sim 289 \text{ ft-lb)}$



Installing the output Gear

LAR15-33

- (3) Use a punch or Screwdriver to lock the lock nut securely at the groove on the drive pinion.



Locking the Lock Nut

LAR15-42 LACS34

- (4) Measure the drive pinion bearing starting force.

Bearing starting force:

$13.8 \sim 16.9 \text{ kg}$
 $(30.4 \sim 37.2 \text{ lbs})$



Measuring the Starting Force

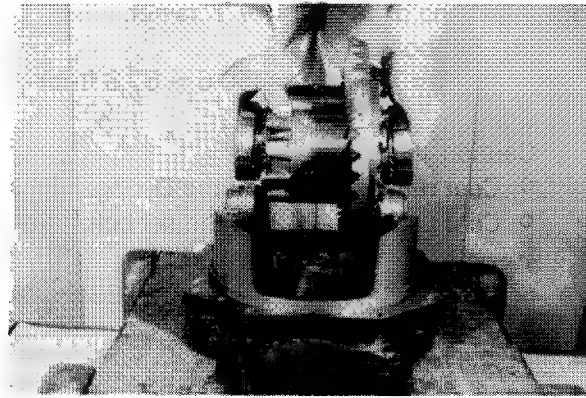
LAR16-3

13. Install the differential case ASSY.

- (1) Install the bearing outer race to the differential case ASSY, and install them to the differential carrier.

Caution:

Install the case ASSY to bring the ring gear into contact with the drive pinion.



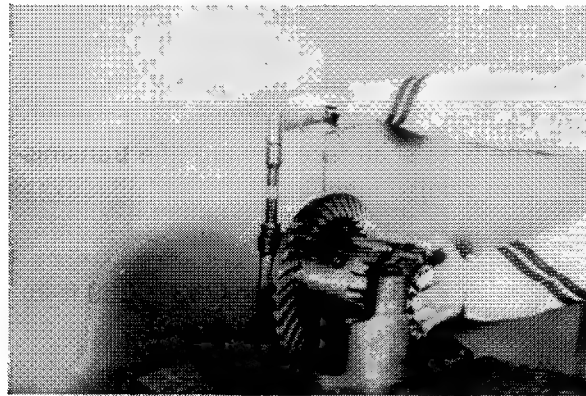
Installing the Differential Case ASSY

LAR16-9

14. Install the bearing cap.

- (1) Install the adjusting nut, and install the bearing cap by aligning the match mark.
- (2) Temporarily tighten the set bolt.

T = 2 kg-m (14.5 ft-lb)

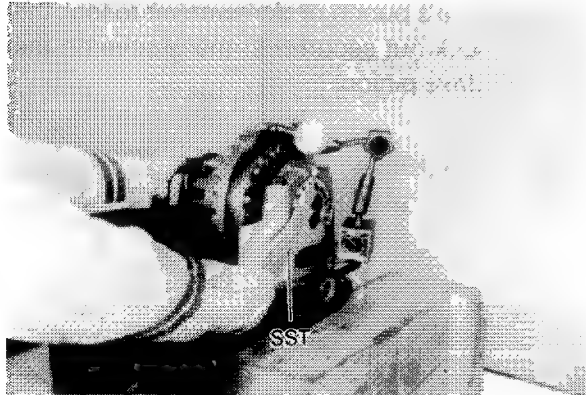


Temporarily Tightening the Set Bolt

LAR16-18

15. Adjust the ring gear backlash.

- (1) Set a dial gauge on the rear face of the ring gear, and tighten the adjusting nuts with the SST.
SST 09630-10110-71
- (2) Measure the thrust clearance, and tighten the adjusting nuts until the thrust clearance becomes 0.
- (3) Tighten the adjusting nuts on both sides by 1 notch each.



Measuring the Thrust Clearance

LAR16-12

- (4) Apply the dial gauge vertical to the ring gear tooth surface, and move the ring gear left and right to measure the backlash.
- (5) Make judgment according to the dial gauge reading.

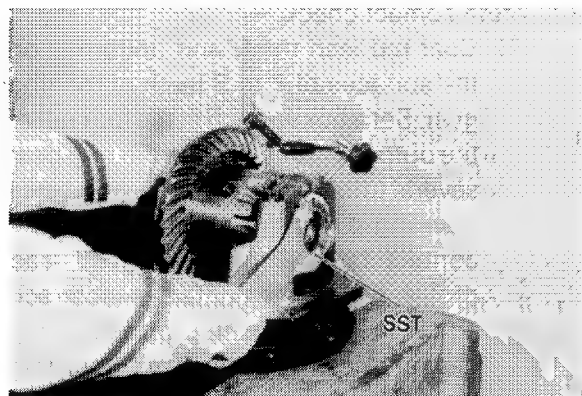
**Backlash = 0.2 — 0.3 mm
(0.008 — 0.012 in)**



Measuring the Backlash

LAR16-16

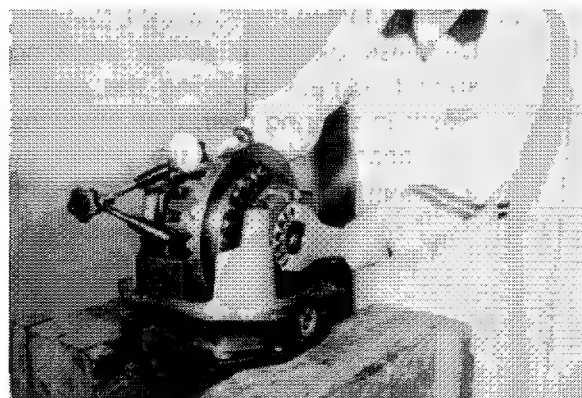
- (6) Use the SST and turn the adjusting nuts to adjust the backlash. For adjustment, loosen one side by 1 notch and tighten the other side by 1 notch at a time to move the differential case gradually while observing the dial gauge reading. SST 09630-10110-71



Adjusting the Backlash

LAR16-15

- ① When the backlash is insufficient:
Loosen the ring gear rear side and tighten the ring gear teeth side to bring the ring gear away from the drive pinion.
- ② When the backlash is excessive:
Loosen the ring gear teeth side and tighten the ring gear rear face side to bring the ring gear closer to the drive pinion.



Adjusting the Backlash

LAR16-11

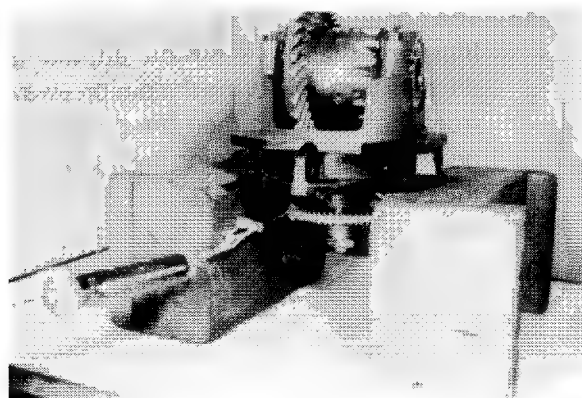
16. Measure the side bearing starting force.

- (1) Wind a string around the output gear and measure the starting force with a spring scale.

Starting force: 15.7 ~ 18.8 kg
(34.5 ~ 41.4 lbs)

Caution:

The value indicated by the spring scale is the resultant force by the combination with the pinion bearing preload.



Measuring the Starting Force

LAR16-22

- (2) Tighten the adjusting nut on the left side (ring gear teeth side) from the position where the play in the differential case axial direction is eliminated by 1.5 — 2.0 notches further to align the lock position.
- (3) Tighten the bearing cap set bolt to the specified torque.
 $T = 12 \sim 14 \text{ kg-m}$
 (86.8 ~ 101.2 ft-lb)

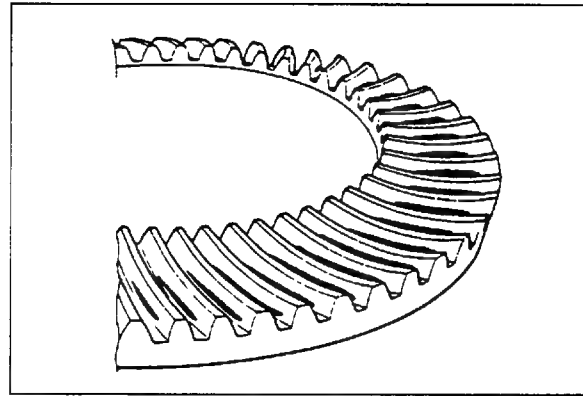


Tightening the Set Bolt

LAR16-19

17. Teeth contact check

- (1) Coat red lead thinly and uniformly on the surfaces of 7 to 8 teeth of the ring gear. Set a box wrench at the lock nut of the output gear and rotate the ring gear several turns in the forward and reverse traveling directions to judge the teeth contact by the transferred red lead profile. If the teeth contact is incorrect, adjust the drive pinion protrusion, ring gear backlash and side bearing starting force.

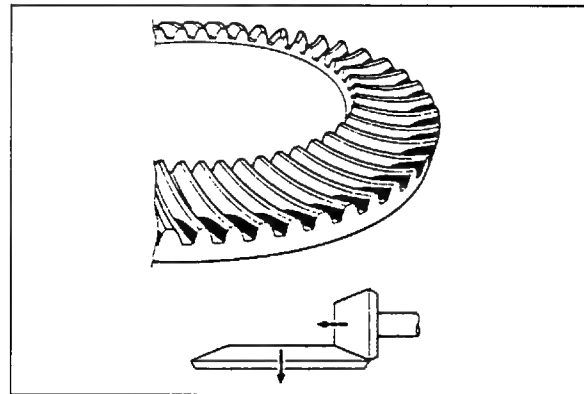


Correct Teeth Contact

LACS23

(2) Heel contact

Decrease the drive pinion adjusting shim thickness to bring the pinion closer to the ring gear, then bring the ring gear away from the pinion by adjusting the backlash.

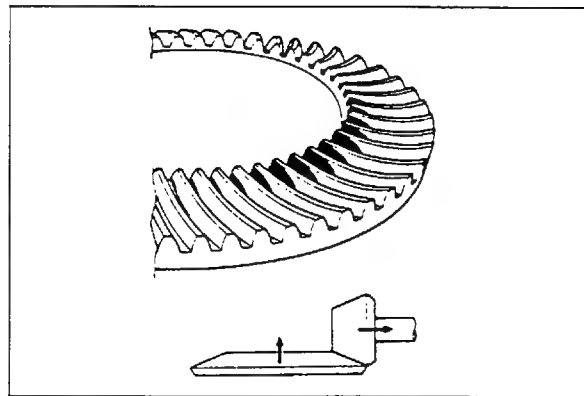


Heel Contact

LACS24

(3) Toe contact

Increase the drive pinion adjusting shim thickness to bring the pinion away from the ring gear, then bring the ring gear closer to the pinion by adjusting the backlash.

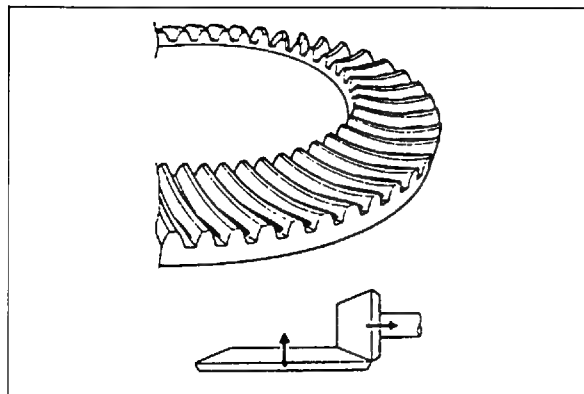


Toe Contact

LACS25

(4) Flank contact (low shallow contact)

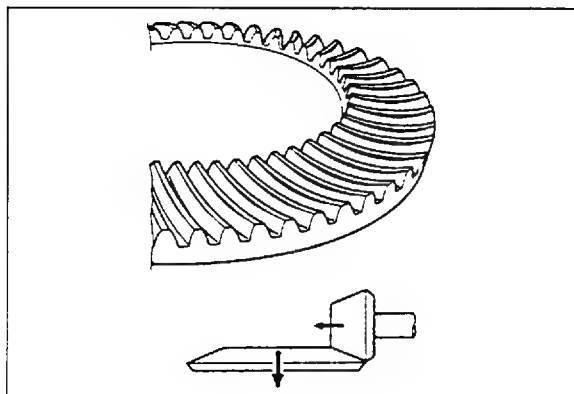
Increase the drive pinion adjusting shim thickness to bring the pinion away from the ring gear, then bring the ring gear closer to the pinion by adjusting the backlash.



Flank Contact

LACS26

- (5) Face contact (high shallow contact)
Decrease the drive pinion adjusting shim thickness to bring the pinion closer to the ring gear, then bring the ring gear away from the pinion by adjusting the backlash.

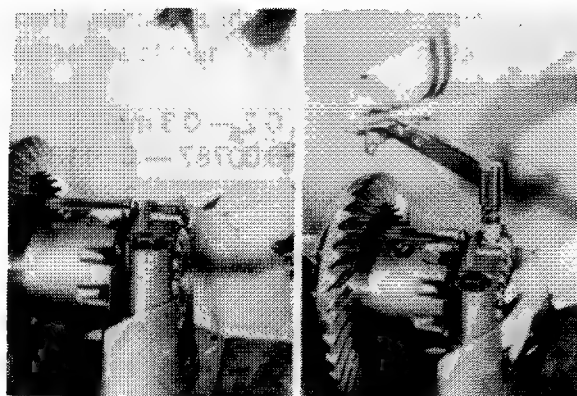


Face Contact

LACS27

18. Lock the bearing cap set bolts by a wire.

- (1) After the teeth contact adjustment, install the adjusting lock. If the stop hole is not aligned, turn the adjusting nut in the tightening direction and install by using the set bolt.
- (2) Lock the set bolts of the bearing cap and adjusting lock by a wire. Twist the wire 3 to 5 times between each pair of set bolts.

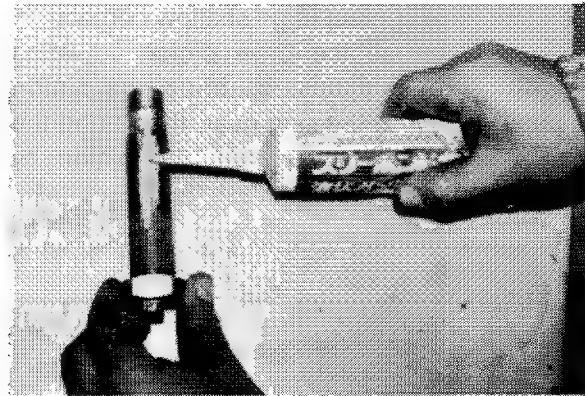


Installing the Adjusting Lock

LAR16-23,24

19. Thrust screw cap installation

- (1) Coat liquid packing on the thrust screw, install the cap at its end, and install them to the differential carrier.



Coating Liquid Packing

LA073-15

- (2) Fully tighten the thrust screw, then return it by about 1/8 turn to adjust the cap clearance.

Clearance: 0.2 — 0.3 mm
(0.00787 — 0.0118 in)

- (3) After the adjustment, tighten the lock nut to the specified torque.

T = 10.5 ~ 13 kg-m (75.9 ~ 94 ft-lb)



Adjusting the Thrust Screw

LAR17-3

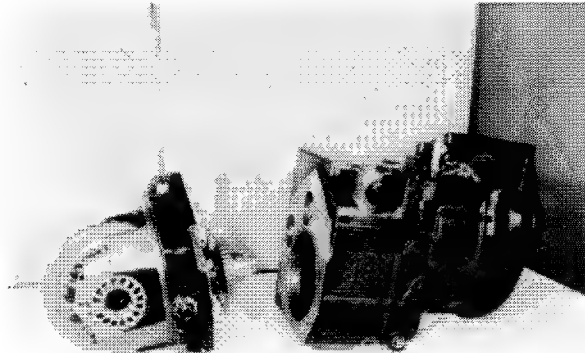
20. Install the differential ASSY.

Caution:

Coat rubber grease on the O-ring.

- (1) Differential ASSY
- (2) Set bolts

21. Install the torque converter & transmission w/differential ASSY to the engine.



Installing the Differential ASSY

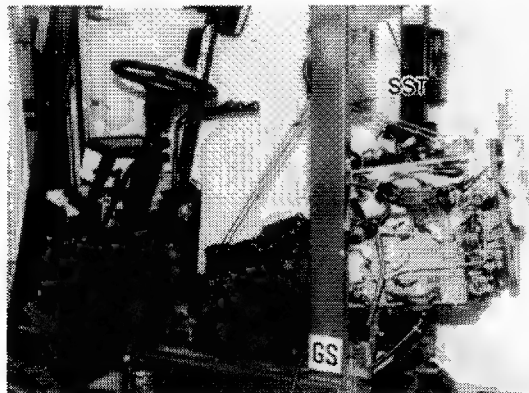
LAR17-5

INSTALLATION

The installation procedure is the reverse of the removal procedure.

1. Jobs after installation

- (1) Coolant supply
Coolant amount: 11.5 ℓ
(3.04 US gal)
- (2) Torque converter oil supply
Oil amount: 9.5 ℓ (2.51 US gal)
- (3) Differential oil supply
Oil amount: 5.0 ℓ (1.32 US gal)
- (4) Engine tune-up
See page 1-9.



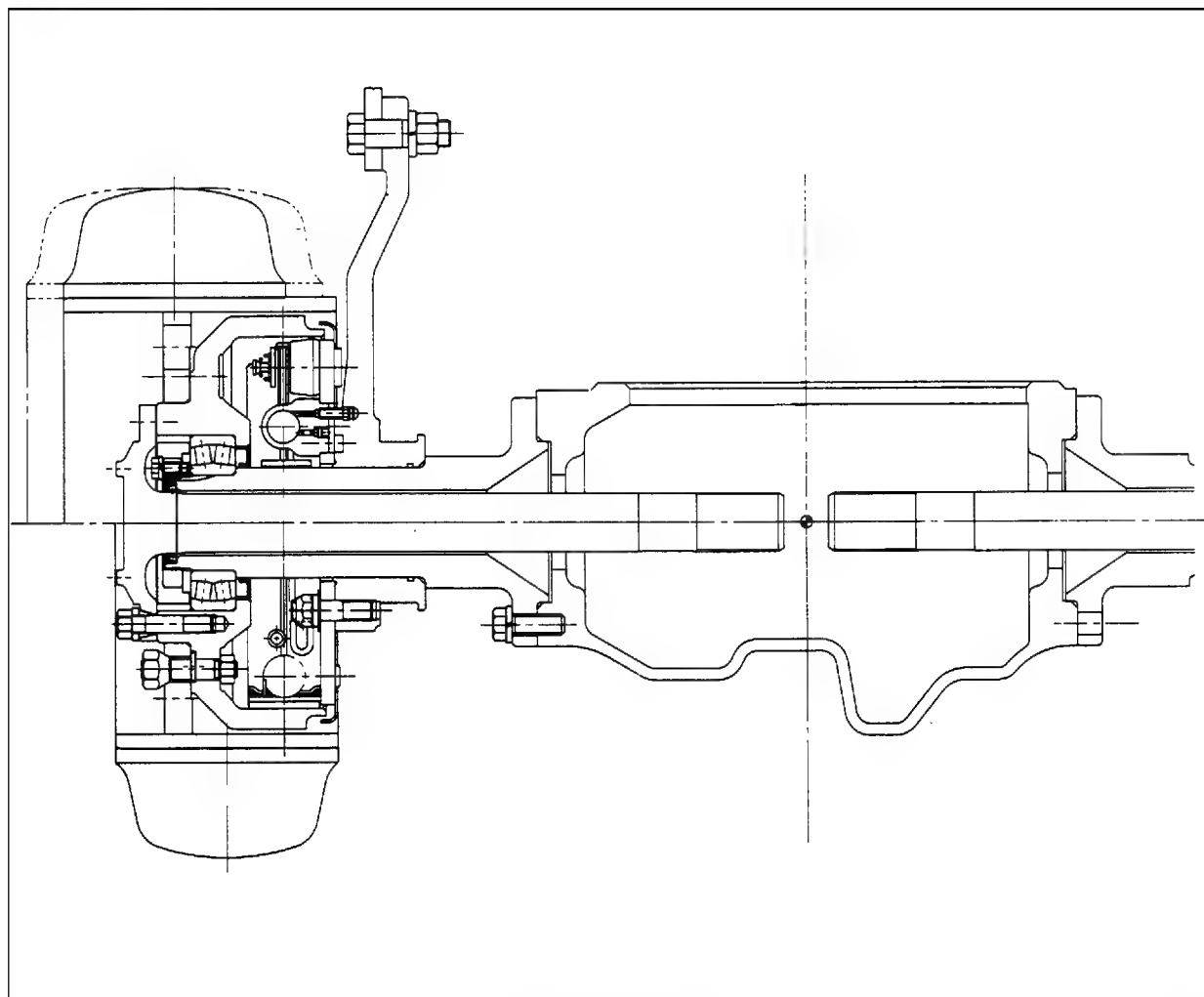
Installing the Engine W/Torque Converter & Transmission

LAR27-29

FRONT AXLE

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SPECIFICATIONS	4-2
COMPONENTS	4-3
FRONT AXLE SHAFT & HUB	4-4
REMOVAL	4-4
DISASSEMBLY	4-5
INSPECTION	4-6
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INSTALLATION	4-7
FRONT AXLE ASSY REMOVAL & INSTALLATION	4-9

GENERAL



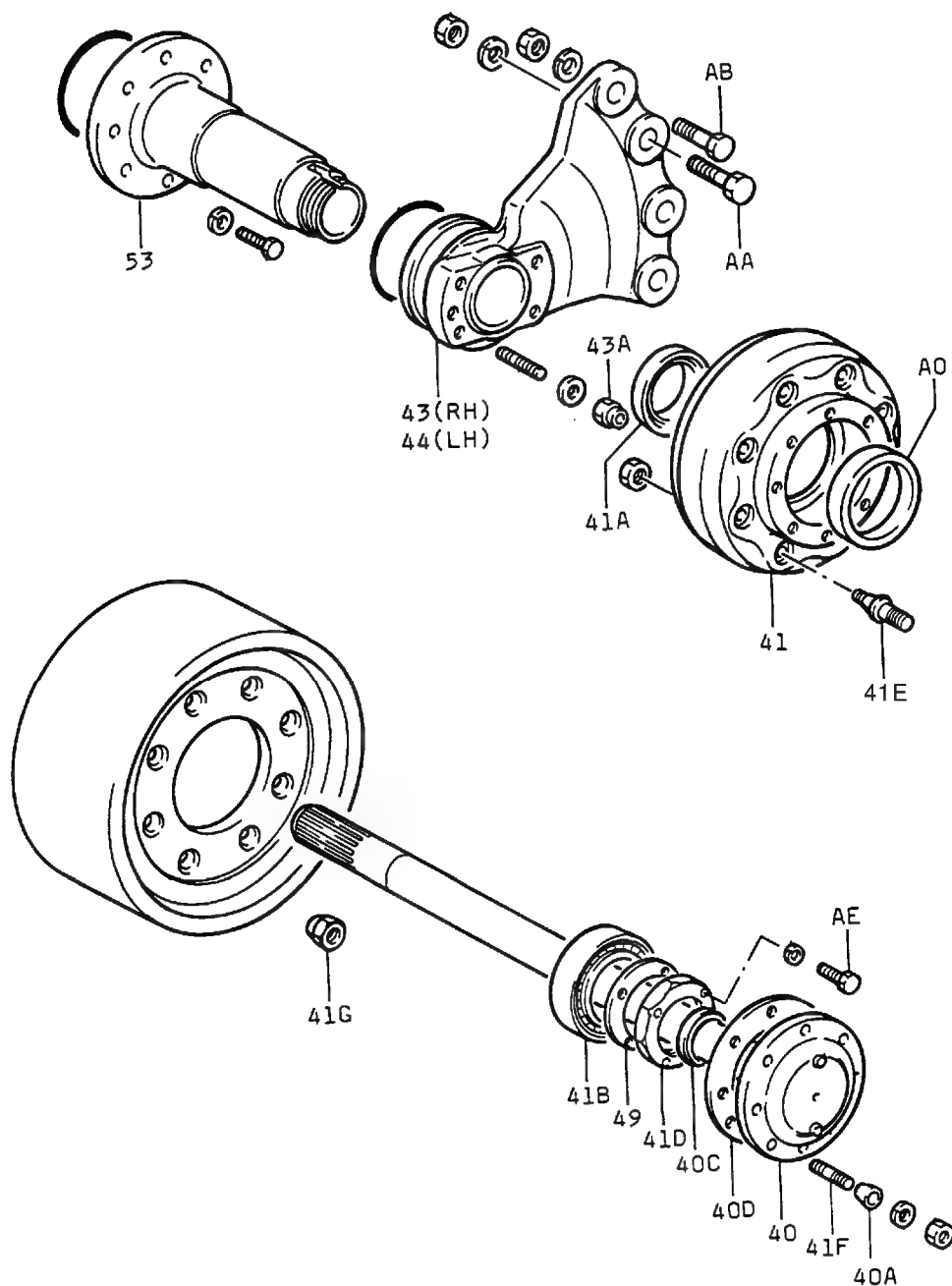
Front Axle Sectional View

LARL2

SPECIFICATIONS

Front axle type	3/4 floating type
Front axle suspension	Frame fixed type
Front axle shaft outside diameter	40 mm
Number of axle shaft spline teeth	31
Tire size	18 x 6 x 12 $\frac{1}{8}$
Tread	795 mm

COMPONENTS



- 40** Shaft, front axle
- 40A** Washer, corn
- 40C** Seal, oil
- 40D** Gasket, front axle shaft
- 41** Hub, front axle
- 41A** Seal, oil
- 41B** Bearing, No. 1
- 41D** Nut, bearing lock
- 41E** Bolt, hub
- 41F** Bolt, stud

- 41G** Nut, hub
- 43** Bracket, front axle, RH
- 43A** Nut, brake set self
- 44** Bracket, front axle, LH
- 49** Plate, lock nut
- 53** Housing, front axle
- AA** Bolt
- AB** Bolt, bracket set
- AE** Bolt
- AO** Spacer

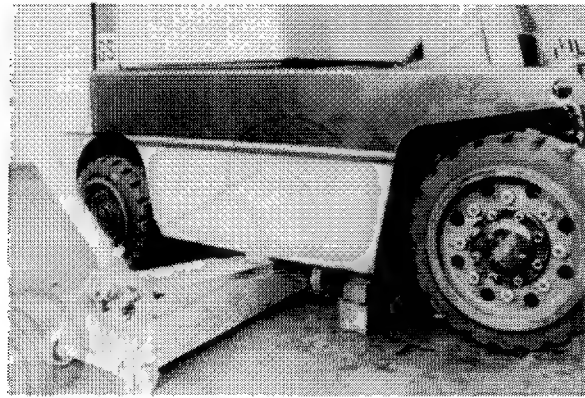
Front Axle Components

LARM51

FRONT AXLE SHAFT & HUB

REMOVAL

1. Remove the front wheels.
 - (1) Loosen the hub nuts.
 - (2) Jack up the frame and place supports under the front part of the frame.



Jacking Up the Frame

LAR17-19

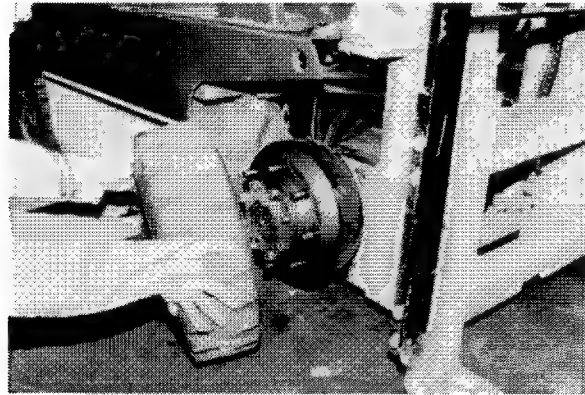
- (3) Hub nuts
- (4) Front wheels

Caution:

Carefully remove because the wheels are heavy.

Drain differential oil.

Oil amount: 5.0ℓ (1.32 US gal)



Removing the Front Wheels

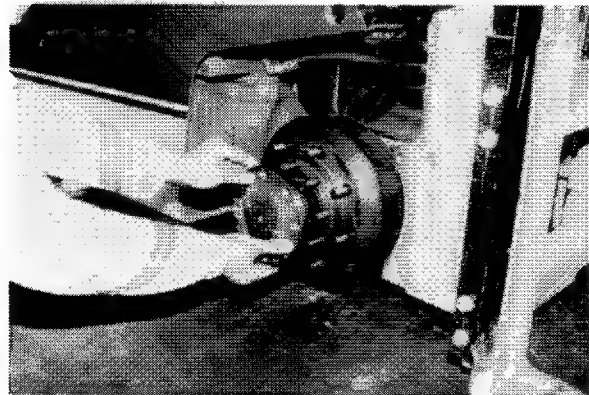
LAR17-12

Remove the axle shaft.

- (1) Set nuts and spring washers
- (2) Corn washers
- (3) Axle shaft

Caution:

When removing the axle shaft, carefully prevent the oil seals from being damaged.

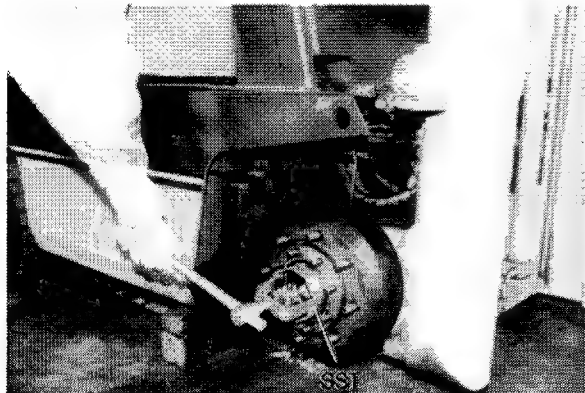


Removing the Axle Shaft

LAR17-17

Remove the front axle hub.

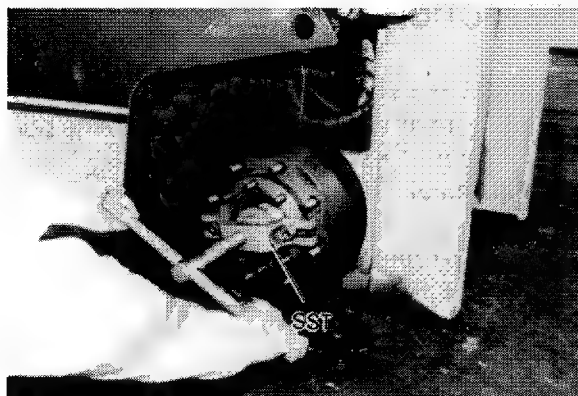
- (1) Remove the stopper bolt, and remove the bearing lock nut by using the SST. SST 09509-55020
- (2) Lock nut plate



Removing the Lock Nut

LAR17-25

- (3) Use the SST and remove the front axle hub and brake drum ASSY.
SST 09310-10160-71



Removing the Axle Hub

LAR17-27

DISASSEMBLY

Caution:

Inspect each part, and disassemble only when the bearing, axle hub or brake drum is found defective.

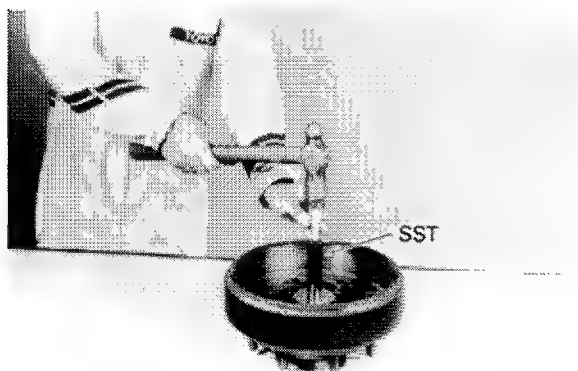
1. Remove the oil seal.
(1) Use a screwdriver to remove the oil seal.



Removing the Oil Seal

LAR19-24

2. Remove the bearing.
SST 09608-35014



Removing the Bearing

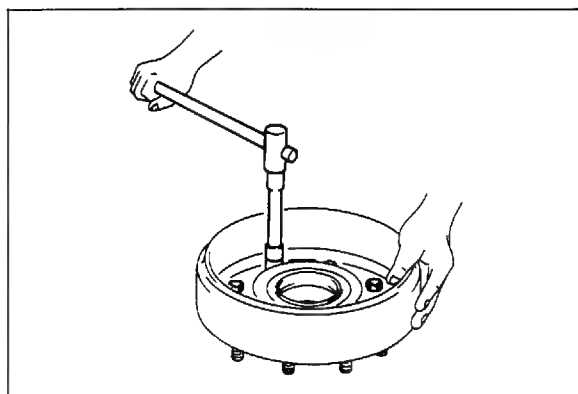
LAR19-23

3. Remove the hub bolts.

Caution:

Remove a hub bolt only when it is found defective.

- (1) Grind off the caulking on the nut end surface.
- (2) Use a press or a brass bar to remove the hub bolt.

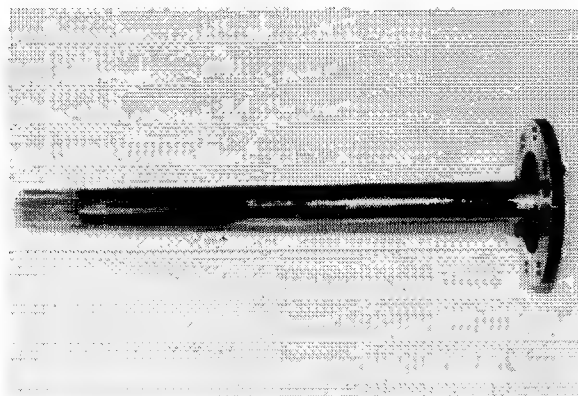


Removing the Hub Bolt

LARS53

INSPECTION

1. Front axle shaft inspection
 - (1) Crack, wear and damage at spline portion
 - (2) Bend

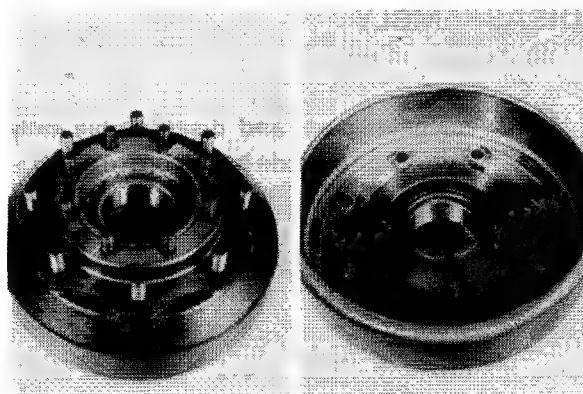


Inspecting the Axle Shaft

LAR10-21

2. Front axle hub inspection
 - (1) Damage of hub bolt
 - (2) Damage at hub bolt lock groove
 - (3) Damage of stud bolt
 - (4) Crack and damage of axle hub
 - (5) Damage, deformation and deterioration of oil seal lip
 - (6) Damage, rotation and abnormal noise of bearing

Important:
inspect the axle hub generally before disassembly.



Inspecting the Axle Hub

LAR20-11,12

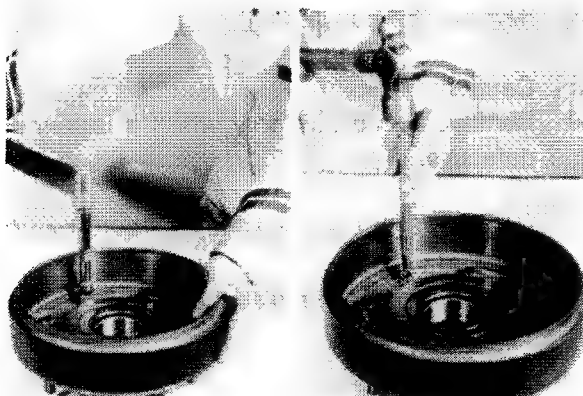
ASSEMBLY

1. Install the hub bolts.
 - (1) Drive the hub bolts into the lock groove.
 - (2) Nuts

$T = 7 \sim 9 \text{ kg-m (50.6 \sim 65.1 ft-lb)}$

Caution:
Coat Locktite #271.

- (3) Use a chisel to caulk the end of the bolt in the form of a cross.

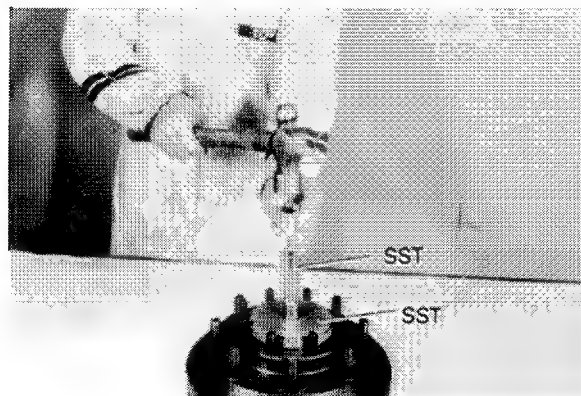


Installing the Hub Bolts

LAR20-13,14

Install the bearing.

- (1) Fill grease sufficiently in the bearing.
- (2) Bearing
SST 09160-10170-71
SST 09320-10410-71
- (3) Spacer

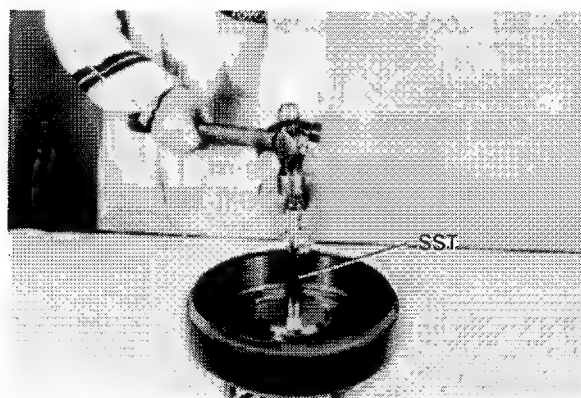


Installing the Bearing

LAR20-4

Install the oil seal.

- (1) Coat grease thinly on the outside of the oil seal.
- (2) Oil seal
SST 09608-35014

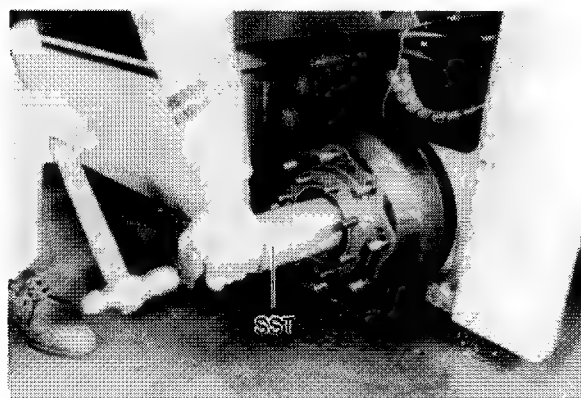


Installing the Oil Seal

LAR20-9

INSTALLATION

1. Install the front axle hub.
 - (1) Fill grease in the axle hub.
 - (2) Return the adjusting screw to the position where the brake shoe is contracted slightly.
 - (3) After checking the correct brake shoe position, install the axle hub ASSY to the front axle.
SST 09370-10410-71



Installing the Axle Hub

LAR20-15

Caution:

When driving in the bearing, apply the SST perfectly to the bearing to make the SST push the whole hub so that the hub will not be returned by reaction.

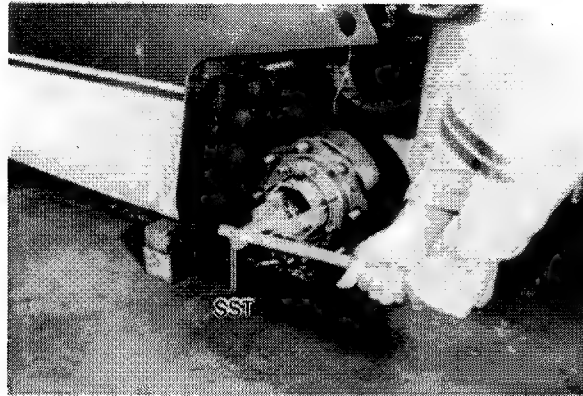
- (4) Lock nut plate



Installing the Lock Nut Plate

LAR20-20

- (5) Lock nut
SST 09509-55020



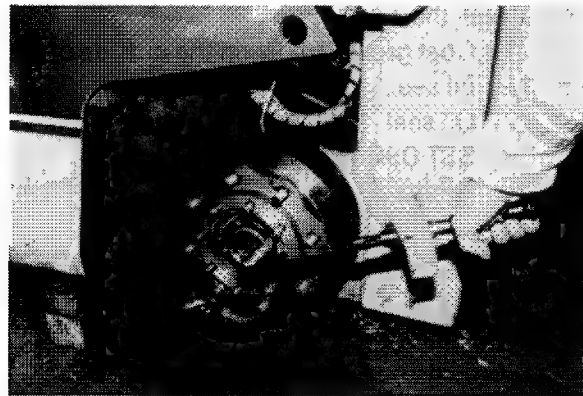
Tightening the Lock Nut

LAR20-21

- (6) Lock nut stopper bolt

Caution:
Coat Locktite #271.

$$T = 1.5 \sim 2.2 \text{ kg-m} \\ (10.8 \sim 16.0 \text{ ft-lb})$$



Tightening the Stopper Bolt

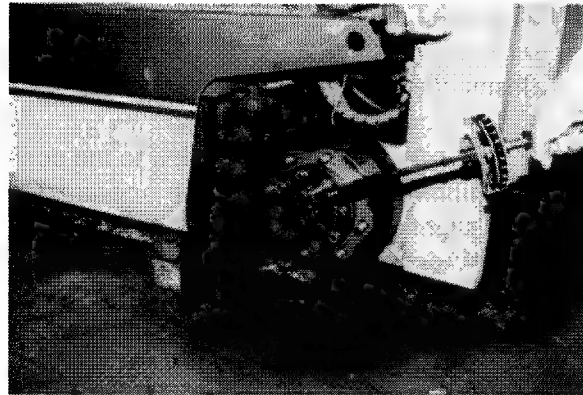
LAR20-25

Install the front axle shaft.

- (1) Axle shaft

Caution:
Use a new packing.

- (2) Cone washer
(3) Spring washer and nut
 $T = 4.0 \sim 5.5 \text{ kg-m}$
(28.9 ~ 39.8 ft-lb)



Installing the Axle Shaft

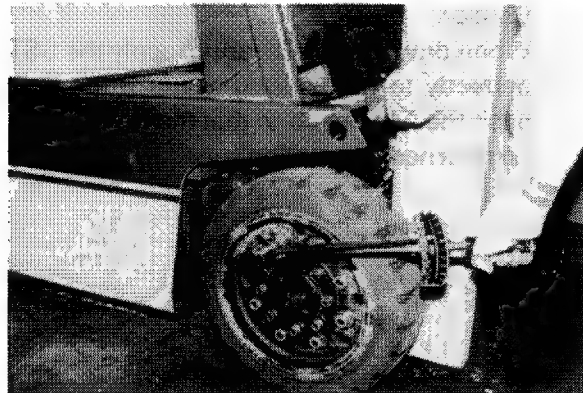
LAR20-28

Front wheels

- (1) Front wheels
(2) Hub nuts
(3) Jack up the frame, and remove supports.
(4) Tighten the hub nuts to the specified torque.
 $T = 11 \sim 20 \text{ kg-m}$
(79.5 ~ 144.6 ft-lb)

Inspection and adjustment after operation

- (1) Inspect the differential oil level.
(2) Adjust the foot brake performance.
(3) Adjust the parking brake performance.
(4) Inspect abnormal noise or abnormality.



Tightening the Hub Bolts

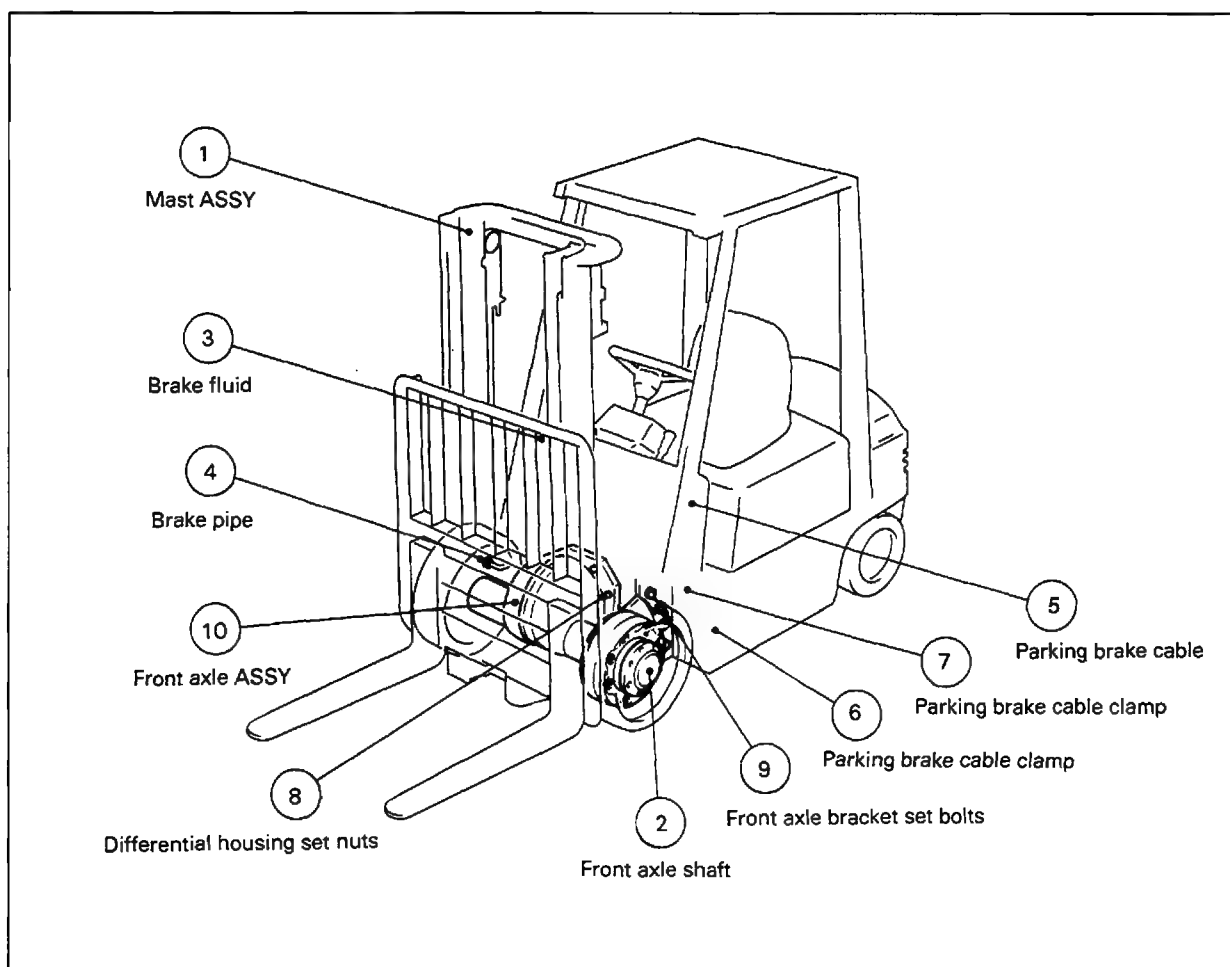
LAR20-30

FRONT AXLE ASSY REMOVAL & INSTALLATION

Preparation

1. Remove the fork.
2. Jack up the frame and place supports under the front part of the frame.
3. Drain differential oil.
Oil amount 5.0 ℓ (1.32 US gal)

Removal & installation



Front Axle Removal/Installation Procedure

LARM52

Removal & installation procedure

1. Mast ASSY w/lift bracket **(Point 1)**
2. Front axle shaft
3. Brake reservoir tank (brake fluid)
4. Brake pipe **(Point 2)**
5. Parking brake cable **(Point 3)**
6. Parking brake cable clamp (lower left side of torque converter & transmission)
7. Parking brake cable clamp (left side of frame) **(Point 4)**
8. Differential housing set nuts **(Point 5)**
Note: Sling the front axle housing with a wire rope and hoist it slightly.
9. Front axle bracket set bolts **(Point 6)**
10. Front axle ASSY **(Point 7)**

Notes for Front Axle ASSY Removal & Installation
(R: Note for removal, I: Note for installation)

Point 1

1. Mast ASSY w/lift bracket

Reference:

Refer to the mast ASSY removal section.

R, I: Weight of mast ASSY w/lift bracket
414 kg (910 lbs)

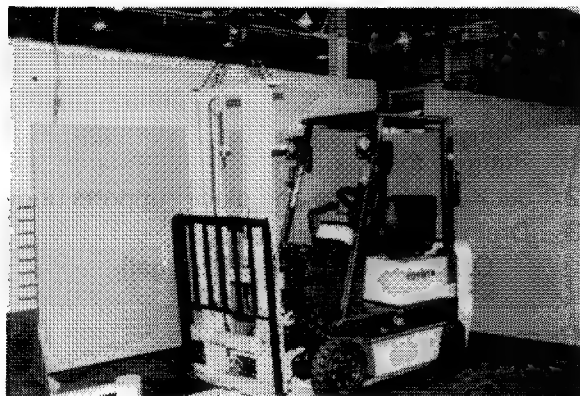
Important:

Tie the tilt cylinder to the frame with a string.

Point 2

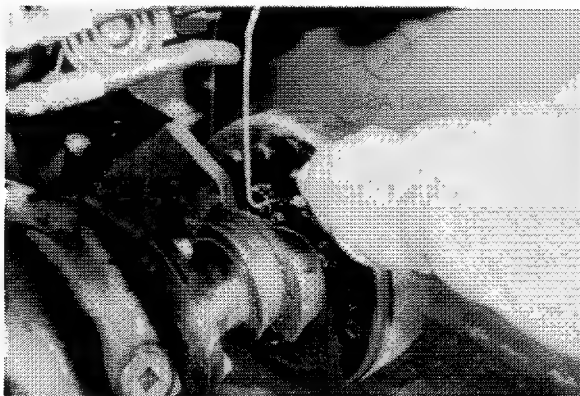
4. Brake pipe

R, I: Loosen the other end of the brake pipe for easier operation. Be sure to re-tighten it after the end of operation.



Mast ASSY

LAR21-23



Brake Pipe

LAR22-13

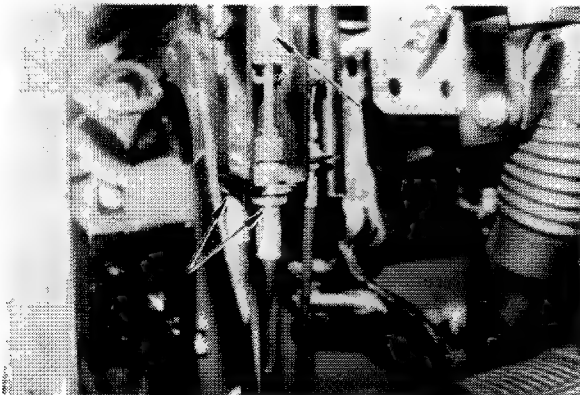
Point 3

5. Parking brake cable

R, I: Cable connecting positions

Front: For brake LH

Rear: For brake RH



Parking Brake Cable

LAR22-15

Point 4

6. Packing brake cable clamp.

R, I: Clamping position and cable position



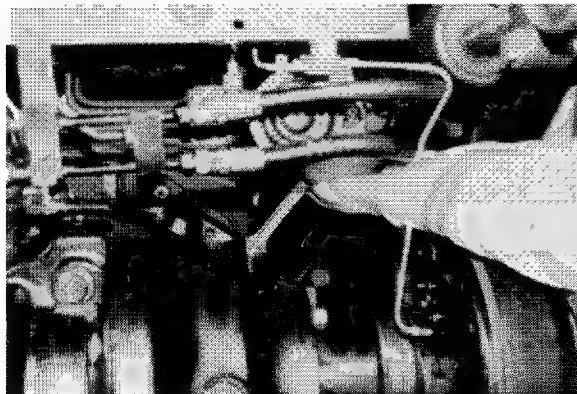
Parking Brake Cable Clamp Position

LAR22-16

Point 5

8. Differential housing set nuts

R, I: Pay special attention to safety in a place not allowing easy operation.



Differential Housing Set Nuts

LAR22-17

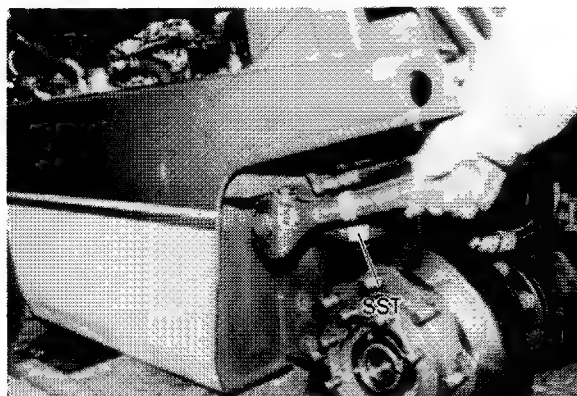
Point 6

9. Front axle bracket set bolts

R: Place a support under the torque converter & transmission case.

Use the SST to loosen two reamer bolts upper and lower.

SST 09310-22000-71



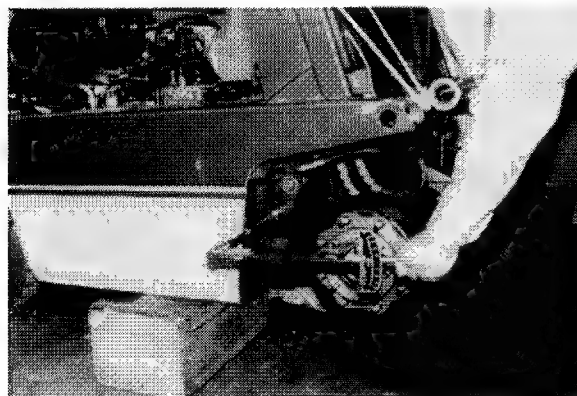
Front Axle Bracket Set Bolts

LAR22-22

I: Use the SST when the bolt holes are not aligned.

SST 09360-10410-71

T = 16 ~ 22 kg-cm
(115.7 ~ 159 ft-lb)



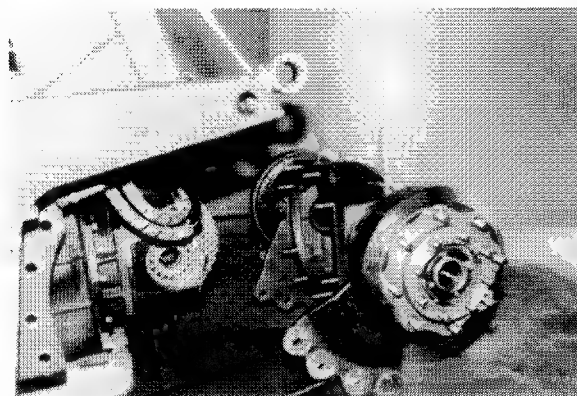
Tightening to the Specified Torque

LAR22-28

Point 7

10. Front axle ASSY

R, I: Move the front axle ASSY horizontally.



Front Axle ASSY

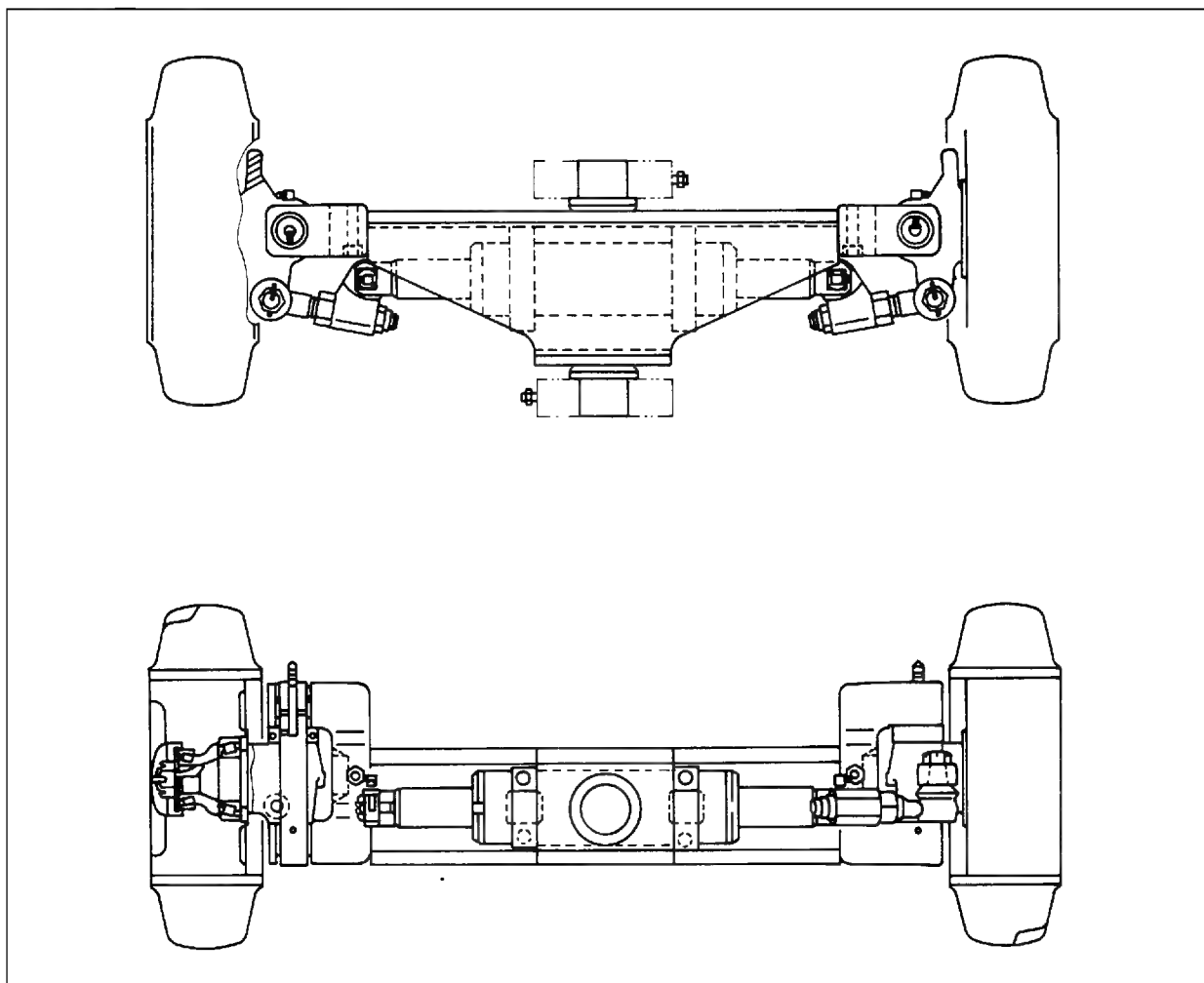
LAR22-25

REAR AXLE

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REAR AXLE ASSY	5-2
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REAR AXLE CYLINDER	5-15
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ASSEMBLY AND INSTALLATION	5-18
REAR WHEEL ALIGNMENT	5-19
TOE IN	5-19
STEERING ANGLE	5-19

REAR AXLE ASSY

GENERAL



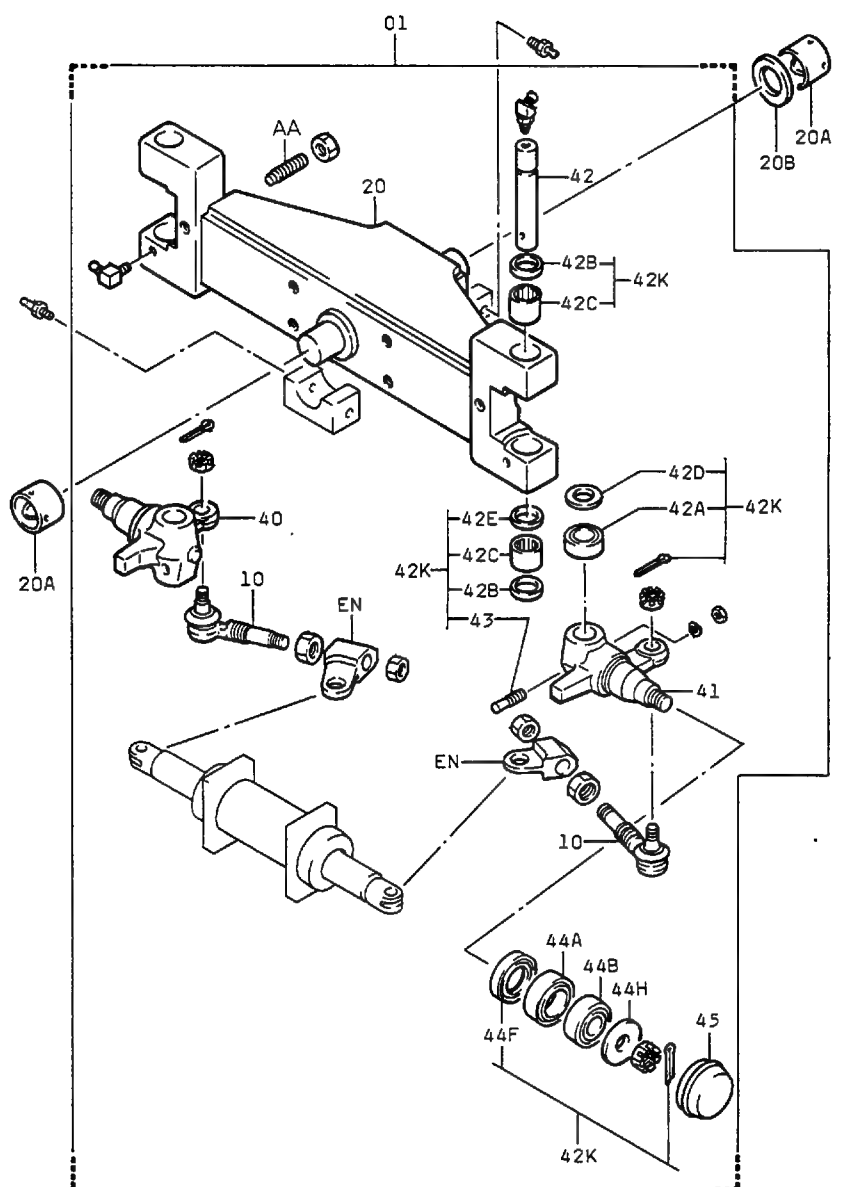
Rear Axle Sectional View

LARM8

SPECIFICATIONS

Vehicle model			1.0 ton vehicle	1.25 ton vehicle	1.5 ton vehicle
Item					
Rear axle type			Elliot type		
Rear axle suspension			Center supported swing type		
Wheel alignment	Toe in	mm (in)	0 (0)		
	Camber		0		
	Caster		0		
	King pin inclination		0		
Minimum turning radius	Outer	mm (in)	1645 (65)	1665 (65.5)	1700 (67)
Tire size			14 × 4-1/2 × 8		

COMPONENTS



- | | | | |
|-----|----------------------------------|-----|----------------------------------|
| 01 | 01 | 42D | Shim, steering knuckle |
| 10 | End ASSY, tie-rod, No. 1 | 42E | Seal, oil, No. 2 |
| 20 | Beam SUB-ASSY, rear axle | 42K | Seal kit, king pin |
| 20A | Bushing, rear axle beam | 43 | Pin, king pin lock |
| 20B | Shim, rear axle beam | 44A | Bearing, inner |
| 40 | Knuckle, steering, RH | 44B | Bearing, outer |
| 41 | Knuckle, steering, LH | 44F | Seal, oil (for rear axle hub) |
| 42 | Pin, steering knuckle king | 44H | Washer, claw (for rear axle hub) |
| 42A | Bearing, steering knuckle thrust | 45 | Cap, rear axle hub |
| 42B | Seal, oil, No. 1 | EN | Joint, tie-rod |
| 42C | Bearing, needle | | |

Rear Axle ASSY Components

LARM18

REMOVAL

Caution:

- Always use wooden blocks or other stands to support the frame underside on the left and right sides.
- Always apply the parking brake and chock the front wheels.
- Make the height of the weight bottom surface above the ground to 400 ~ 500 mm (15.7 ~ 19.7 in) to make operation easy.

1. Remove the radiator cover

Remove the balance weight

- (1) Set bolt (width across flats: 46 mm (1.8 in))
- (2) Balance weight

Caution:

Always remove the radiator cover before removing the weight.



Removing the Balance Weight

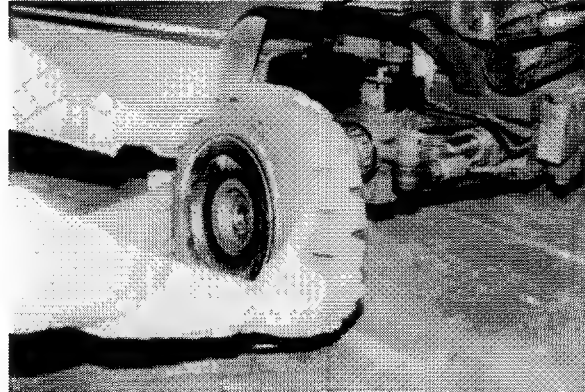
LAR29-8

Remove the rear wheel

- (1) Hub caps
- (2) Cotter pins
- (3) Loosen the castle nut.
- (4) Jack up the frame.
- (5) Support the frame underside with wooden blocks.

Caution:

After setting the wooden blocks, check sure contact.



Removing the Rear Wheels

LAR29-13

- (6) Castle nuts
- (7) Claw washers
- (8) Outer bearings
- (9) Rear wheels

Disconnect the power cylinder piping



Disconnecting the Power Cylinder Piping

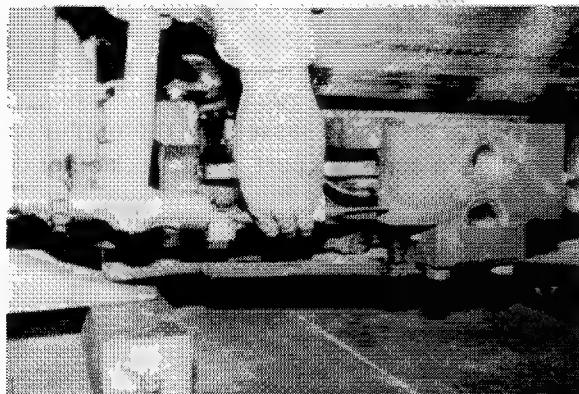
LAR29-14

Punch matching mark

- (1) Punch the matching mark on the front bracket.
- (2) Punch the matching mark on the rear bracket.

Caution:

The front and rear brackets are different in shape. Punch the matching marks for easy discrimination.



Punching the Matching Marks

LAR29-19

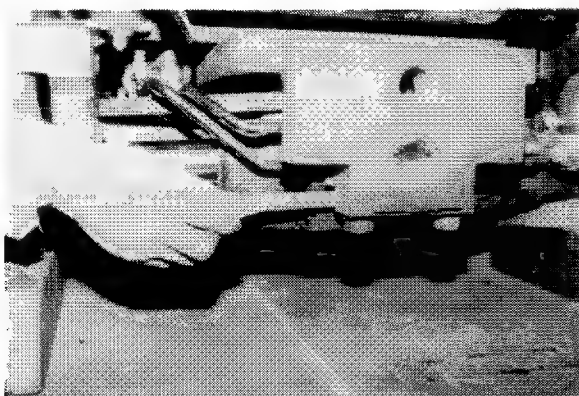
Measure the rear axle beam front and rear play

- (1) Push the rear axle beam fully forward.
- (2) Measure the rear axle front-rear play on the rear side.

Standard front-rear play:

0.02~0.40mm

(0.000787~0.0157 in)

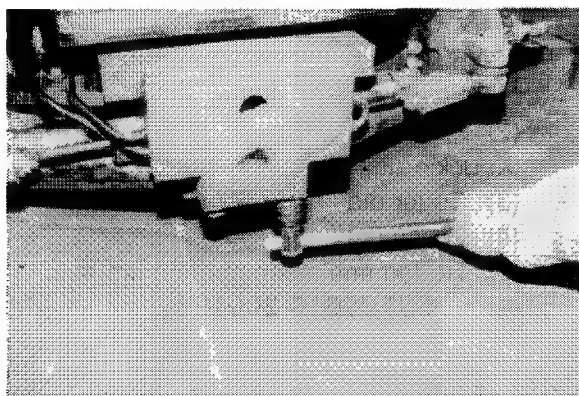


Measuring Front-Rear Play

LAR29-20

Remove the rear axle bracket.

- (1) Jack up the rear axle at the center.
- (2) Bracket bolts
- (3) Rear axle bracket



Removing the Bracket

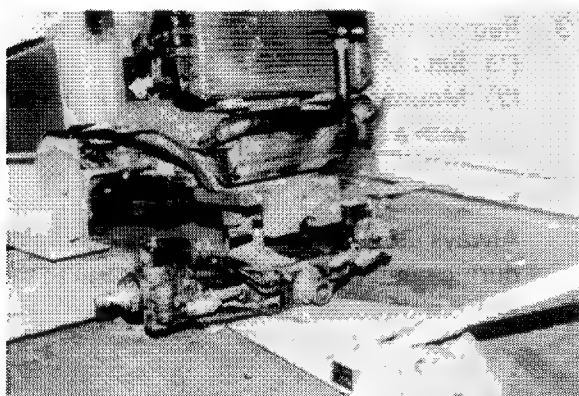
LAR29-16

Remove the rear axle ASSY

- (1) Gradually lower the jack
- (2) Extract the rear axle ASSY backward.

Caution:

Carefully operate so as not to bring the rear axle ASSY into contact with the frame.



Removing the Rear Axle

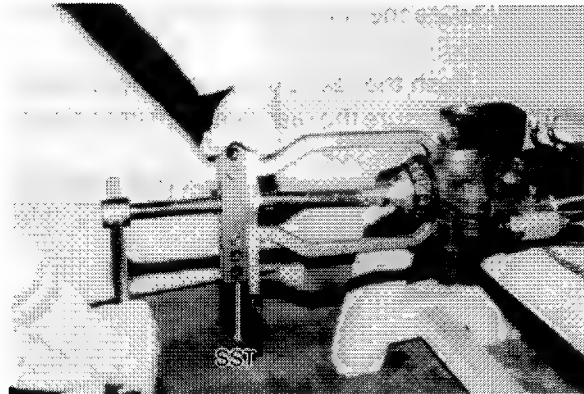
LAR29-24

DISASSEMBLY

Caution:

Before starting disassembly, thoroughly wash each part to remove dirt and measure the dimension of each adjusting part. Also check other defects.

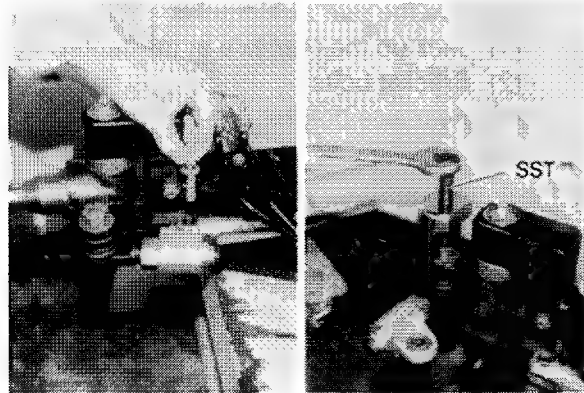
1. Inner bearing and oil retainer removal.
SST 09950-20017



Removing the Bearing

LAR29-26

2. Disconnect the tie-rod end.
(Cylinder side)
(1) Snap ring
(2) Pin
(Knuckle side)
(3) Cotter pin
(4) Castle nut
(5) Tie-rod end
SST 09610-20012



Disconnecting the Tie-rod End

LAR29-32,30-7

Remove the lock pin for the king pin.

- (1) Set nut
- (2) Mount service nut and drive the pin out with a suitable rod.

Note:

Always use service nut (allowing damaging during operation) to prevent damage to the lock pin threaded portion.

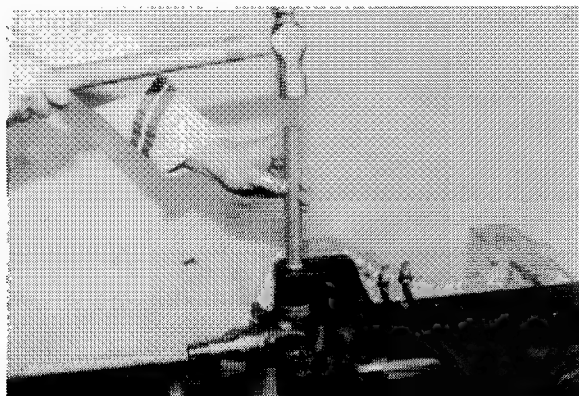


Removing the King Pin

LAR30-11

Remove the King Pin

- (1) Grease fitting
- (2) King Pin



Removing the King Pin

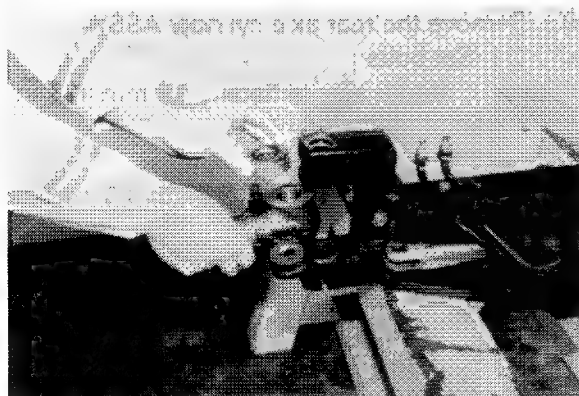
LAR30-17

Remove the steering knuckle.

- (1) Thrust bearing
- (2) Shim
- (3) Steering knuckle

Caution:

Keep removed shims in order, check the quantity and thicknesses so as not to lose them.



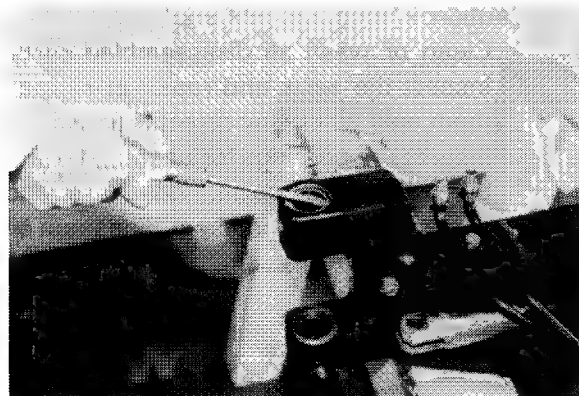
Removing the Steering Knuckle

LAR30-19

Remove the oil seal

Caution:

Remove the oil seal only when the oil seal and needle bearing are damaged.



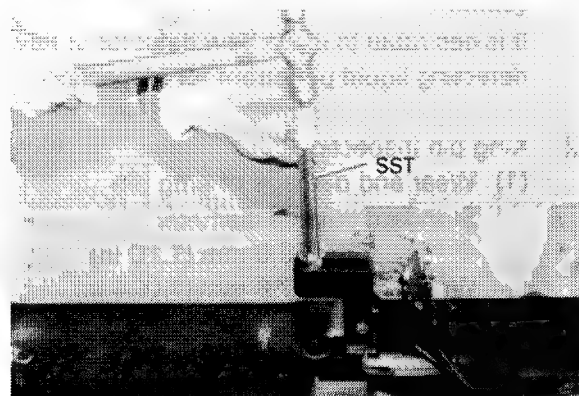
Removing the Oil Seal

LAR30-20

Remove the needle bearing. SST 09620-30010

Caution:

Remove the needle bearing only when it is damaged.

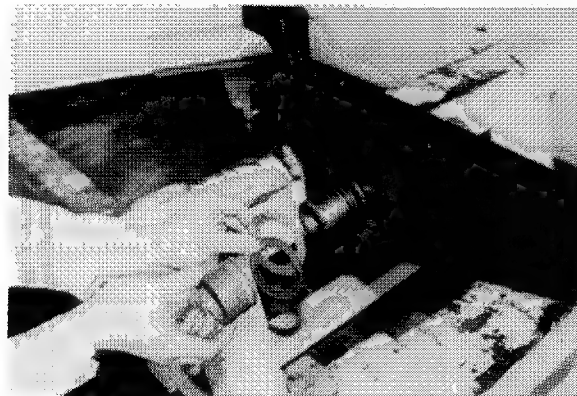


Removing the Needle Bearing

LAR30-22

Remove the support pin bushing and shims.

- (1) Bushing
- (2) Shims



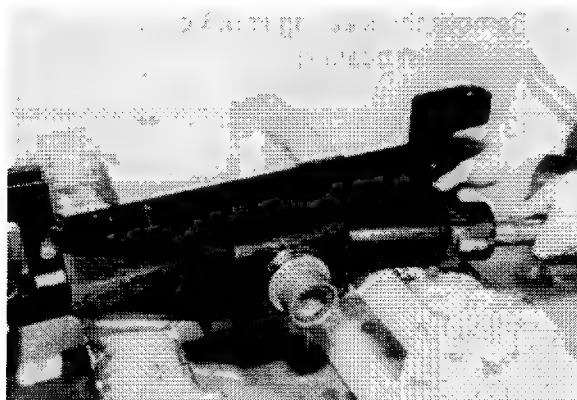
Removing the Bushing and Shims

LAR30-37

Remove the rear axle cylinder ASSY

- (1) Set bolts
Width across flats: 19 mm (0.7 in)

- (2) Rear axle cylinder



Removing the Cylinder ASSY

LAR30-33

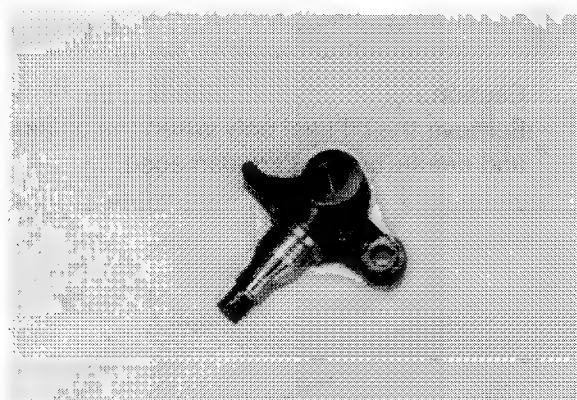
INSPECTION

Caution:

- Clean or wash all disassembled parts. Inspect the parts and repair or replace them only when any defect is found.
- Inspect the bearings for unsmooth rotation, abnormal noise, looseness and damages visually and by setting them oil shaft.

Steering knuckle inspection

- (1) Cracks and damages at spindle root and thread



Inspecting the Steering Knuckle

LAR30-40

Caution:

It is desirable to use a flaw detector or flaw detecting liquid penetrant for inspection.

King pin inspection

- (1) Wear and damage of King pin
Standard outside diameter:
28.0 mm (1.10 in)
Wear limit: 27.8 mm (1.094 in)



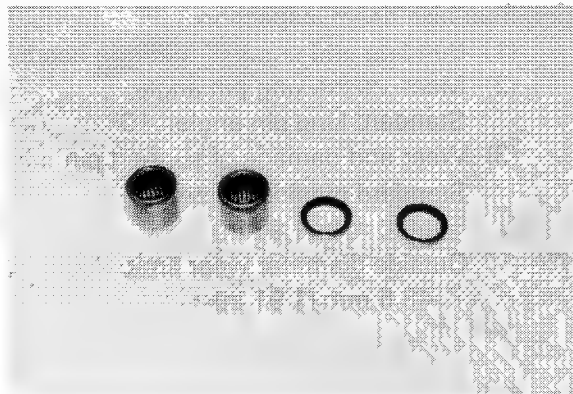
Inspecting the King Pin

LAR31-7

Caution:

When worn beyond the limit, replace the king pin together with the king pin bearing.

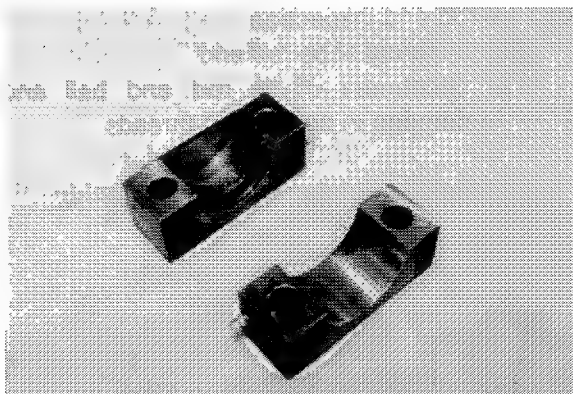
3. Needle bearing and oil seal inspection
 - (1) Damage of needle bearing for king pin
 - (2) Damage of oil seal for king pin



Inspecting the Needle Bearing

LAR16-17

4. Rear axle support pin cap inspection
 - (1) Damage or crack of cap
 - (2) Excessive wear or rusting on cap interior surface



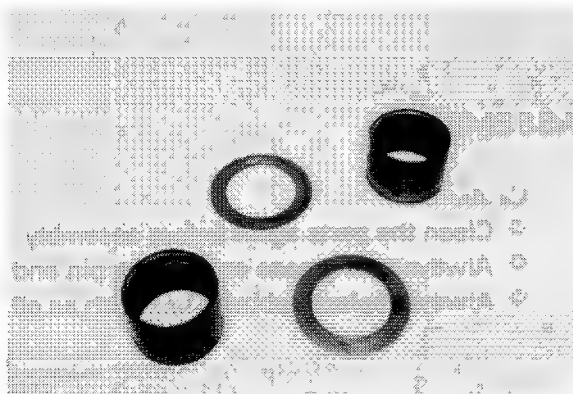
Inspecting the Support Pin Cap

LAR31-19

5. Support pin bush and shim inspection
 - (1) Wear on bush bore
Wear limit: 52.0 mm (2.05 in)
 - (2) Damage or deformation of shims

Caution:

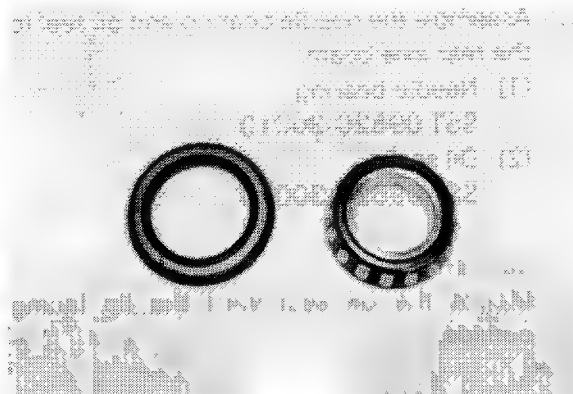
Always replace the shim if the bush oil groove is worn out.



Inspecting the Support Pin Bush and Shims

LAR31-13

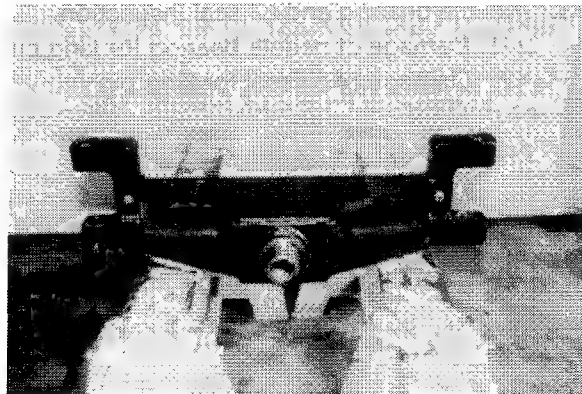
6. Wheel bearing and oil seal inspection
 - (1) Inspect the wheel bearing for unsmooth rotation and abnormal noise, and impact the rollers and holder for damage.
 - (2) Damage of oil seal



Inspecting the Bearing and Oil Seal

LAR31-17

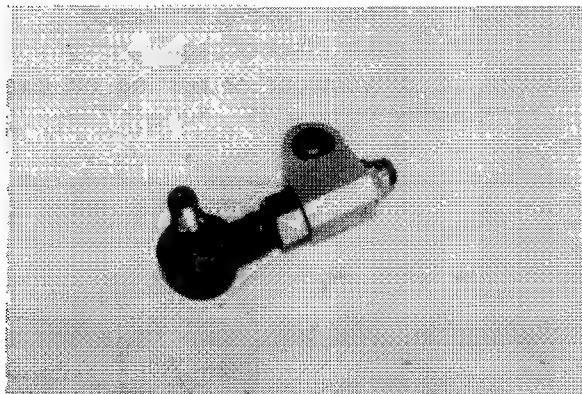
7. Rear axle beam inspection
 - (1) Bending and crack of rear axle beam
 - (2) Measure the king pin angle.
Standard king pin angle: 0°
 - (3) Wear and damage of support pin
Standard outside diameter
50.0 mm (1.97 in)
Outside diameter wear limit:
48.5 mm (1.91 in)



Inspecting the Rear Axle Beam

LAR31-9

8. Tie rod end inspection
 - (1) Bending of tie rod end
 - (2) Looseness of tie rod end ball and damage in tie rod end threads



Inspecting the Tie Rod End

LAR31-11

ASSEMBLY

Caution:

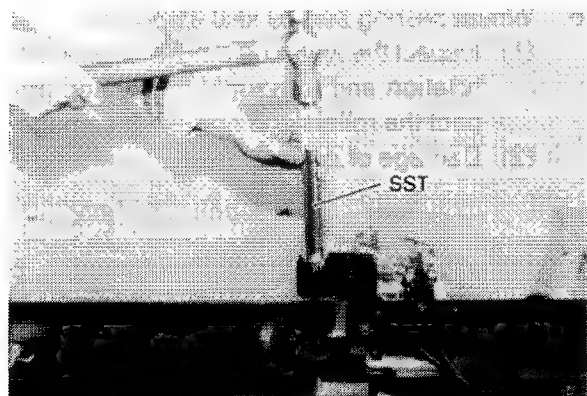
- Clean the parts again before assembly.
- Always coat grease on the king pin and needle bearings.
- Always replace rubber parts such as oil seals when disassembled.

Assemble the needle bearing and oil seal to the rear axle beam.

- (1) Needle bearing
SST 09620-30010
- (2) Oil seal
SST 09620-30010

Caution:

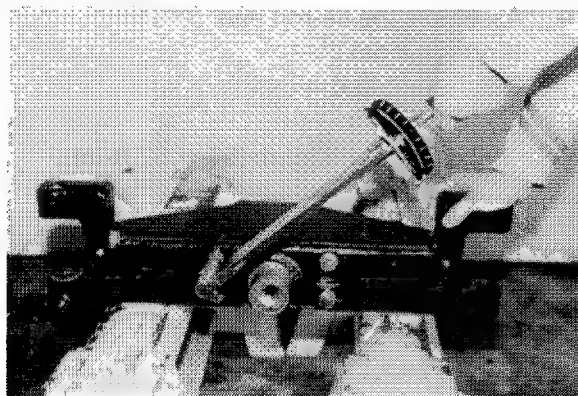
Mount the oil seal with the lip facing outside.



Assembling the Needle Bearing and Oil Seal

Install the rear axle cylinder ASSY to the rear axle ASSY.

- (1) Rear axle cylinder ASSY
- (2) Set bolts
 - Width across flats: 19 mm (0.7 in.)
 - T = 7.5 ~ 11 kg-m
(54.2 ~ 79.5 ft-lb)



Installing the Rear Axle Cylinder

LAR32-2

Assemble the steering knuckle.

- (1) Steering knuckle
- (2) Thrust bearing

Caution:

Assemble the thrust bearing above the steering knuckle.

- (3) Adjust the steering knuckle rotation with shims.

Shim adjustment shall be carried out above the thrust bearing.

Specified clearance:

0.02 ~ 0.12 mm
(0.0008 ~ 0.004 in.)

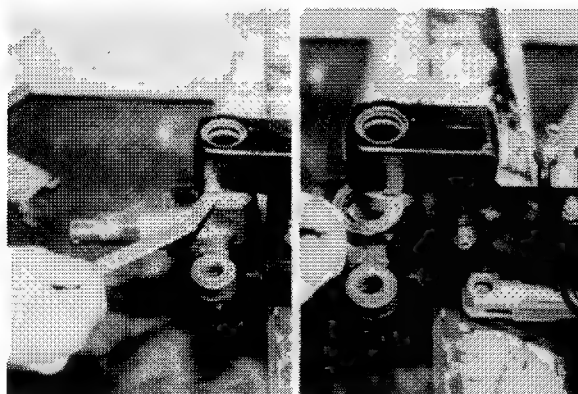
Shim thickness:

0.1 mm (0.004 in.)
0.2 mm (0.008 in.)
0.5 mm (0.02 in.)

- (4) King pin
- (5) Adjust the steering knuckle pre-load.
 - 1) After shim adjustment, measure the pre-load with a spring scale attached to the end of the steering knuckle spindle.

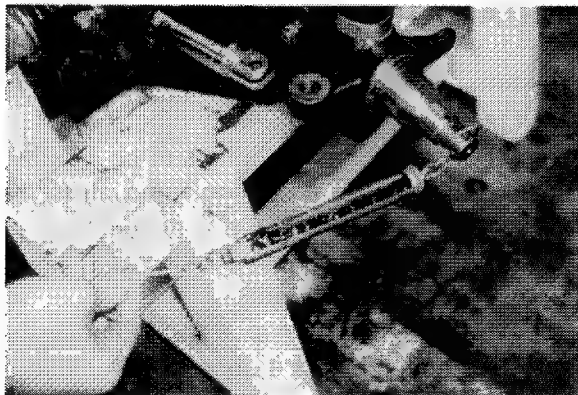
Steering knuckle pre-load:
3 ~ 5 kg (6.6 ~ 11.0 lb)

 - 2) When the pre-load is insufficient, readjust and measure again.
- (6) Install the steering knuckle.
 - 1) After pre-load adjustment, align the king pin with the lock pin hole position.
 - 2) Drive in the lock pin.
 - 3) Locknut
 - T = 3 ~ 4.5 kg-m
(22 ~ 32 ft-lb)



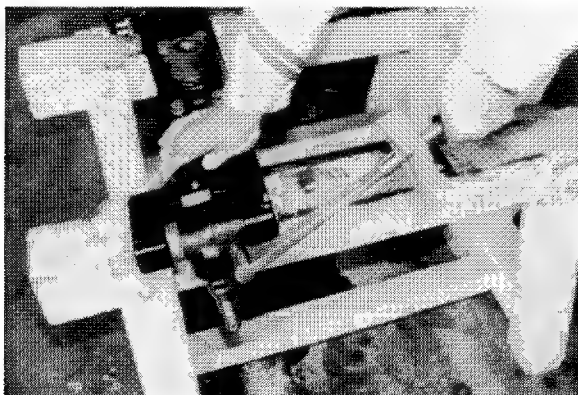
Steering Knuckle Shim Adjustment

LAR32-7.9



Measuring the Pre-load

LAR32-10



Installing the Steering Knuckle

LAR32-15

Assemble the tie-rod end.

(Knuckle side)

(1) Tie-rod end

(2) Castle nut

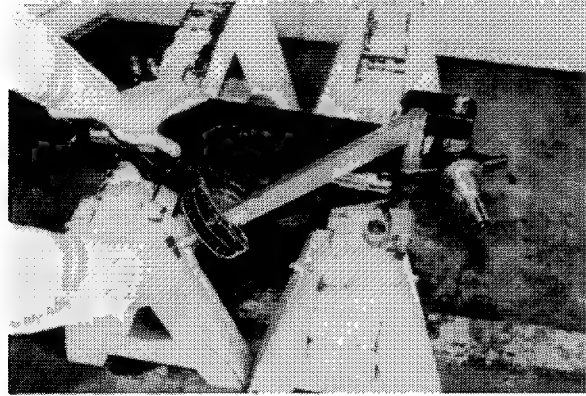
$T = 7 \sim 8 \text{ kg-m (51 \sim 57 ft-lb)}$

(3) Cotter pin

(Cylinder side)

(4) Pin

(5) Snap ring



Assembling the Tie-rod End

LAR32-17

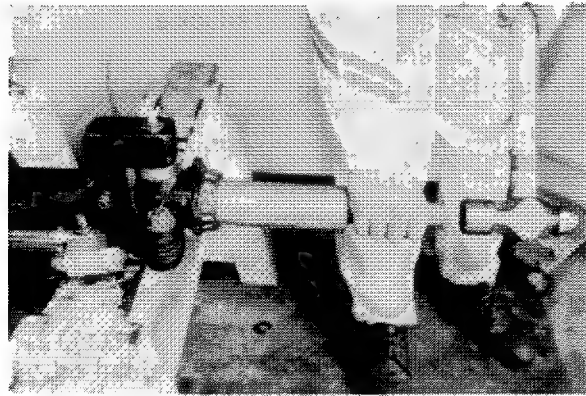
Assemble the oil retainer

Assemble the inner bearing.

SST 09370-20270-71

Caution:

Driving at an angle will damage the knuckle spindle. Carefully drive in the bearing straight.

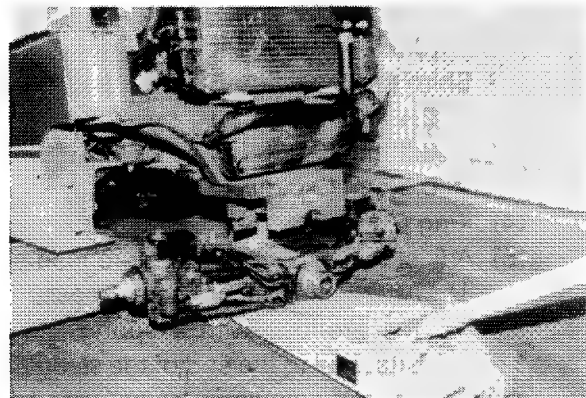


Assembling the Inner Bearing

LAR32-23

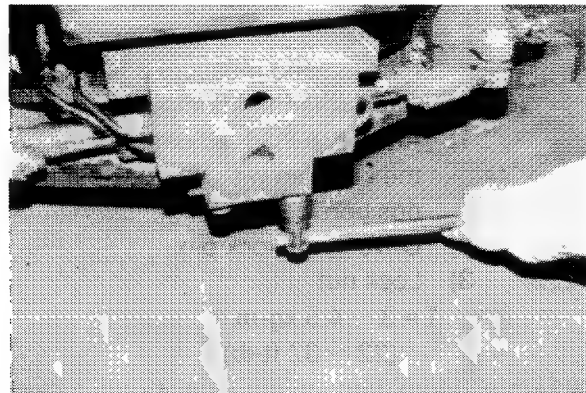
INSTALLATION

1. Install the rear axle ASSY to the vehicle.
 - (1) Set the rear axle ASSY on the jack.
 - (2) Install shims (thickness to be equal to that measured during removal) to the front side center pin.
 - (3) Coat grease on the bushing and insert it in the pin section.
 - (4) Place the rear axle ASSY under the frame and jack it up.
 - (5) Install the rear axle bracket according to the matching marks.



Installing the Rear Axle (1)

LAR29-24



Installing the Rear Axle (2)

LAR29-16

2. Measure the rear axle clearance.

Specified clearance (front and rear):

0.02 ~ 0.40 mm (0.0008 ~ 0.016 in.)

Shim thickness: 0.3 mm (0.01 in.)

0.5 mm (0.02 in.)

1.2 mm (0.05 in.)

2.3 mm (0.09 in.)

Caution:

- Measure the clearance on the rear side with the rear axle fully pushed toward the front side.
- Use shims from the thickest one for adjustment.
- If the clearance exceeds the specified value, remove the axle assembly and replace the shim with a proper one.

Tighten the rear axle bracket.

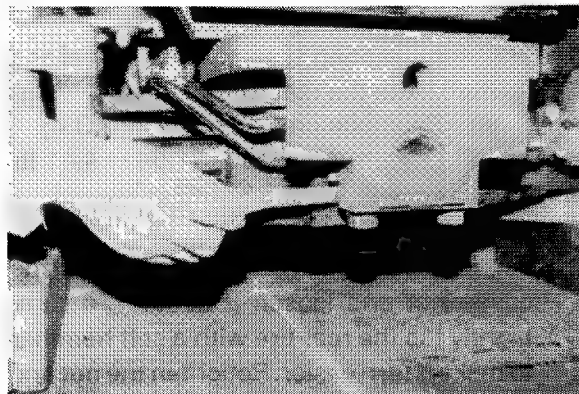
(1) Rear axle bracket

(2) Set bolts

T = 12.0 – 17kg-m

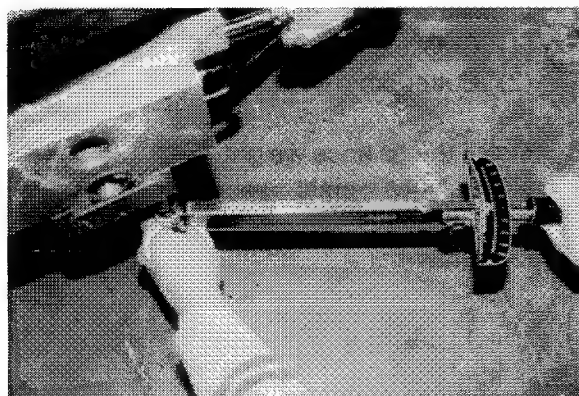
(86.7 ~ 123 ft-lb)

Installation the Power Cylinder Piping



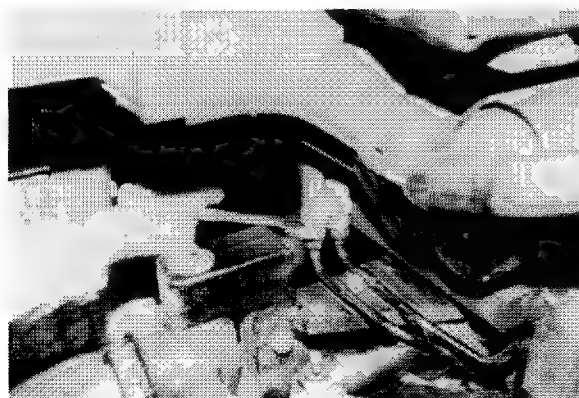
Measuring The Rear Axle Clearance

LAR29-20



Tighten the Set Bolts

LAR33-9



Installing the Power Cylinder Piping

LAR29-14

5. Install the rear wheels

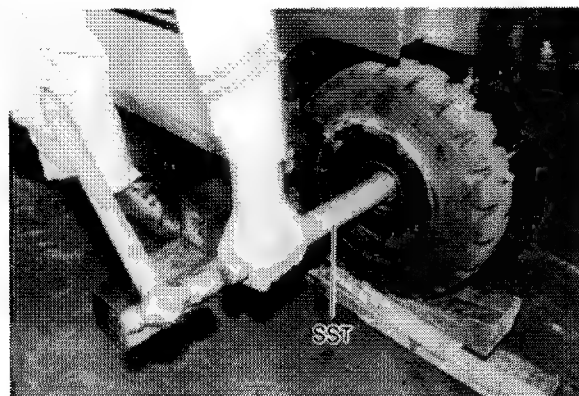
(1) Rear wheels

(2) Outer bearing

SST 09110-30200-71

(3) Claw washer

(4) Castle nut



Installing the Rear Wheels

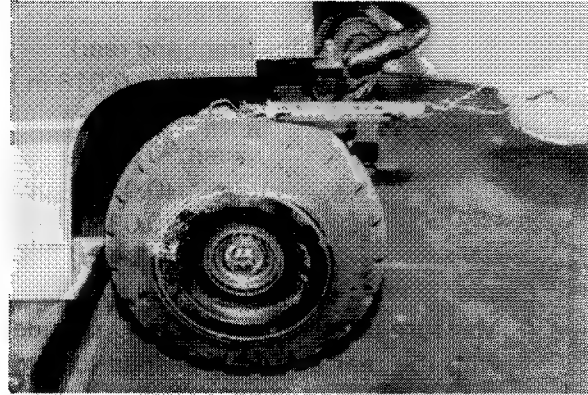
LAR33-18

6. Measure the rear axle preload.
 - (1) Hook a spring scale to a rear wheel and measure the rear axle preload.

Rear axle preload: 0.7 ~ 2.0 kg
(1.54 ~ 4.41 lb)

Note:

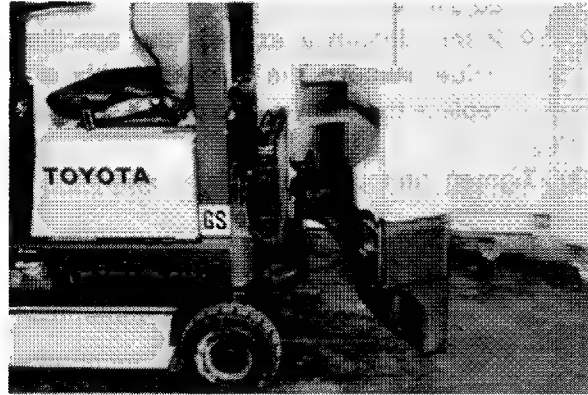
For preload adjustment, fully tighten the castle nut and loosen it about 1/4 turn. Lightly tap the rear tire with a soft hammer to make it turn easier. Retighten the nut and measure the preload.



Measuring the Rear Axle Preload

LAR33-20

7. Install the grease cap.
 - (1) Grease cap
 - (2) Cotter pin
8. Install the balance weight
 - (1) Balance weight
 - (2) Set bolt
 - (3) Draw-bar



Installing the Balance Weight

LAR29-3

9. Install the radiator cover

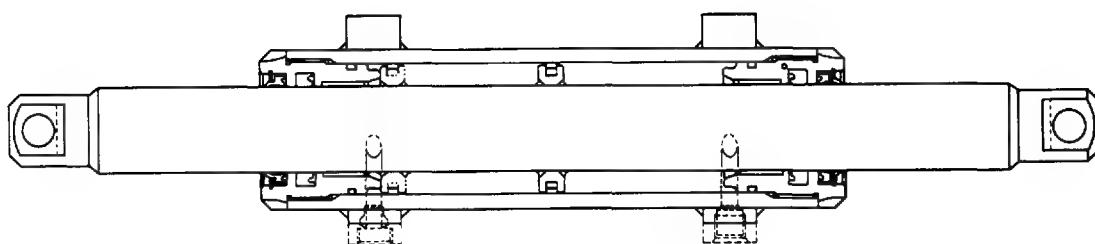


Installing the Radiator Cover

LAR22-14

REAR AXLE CYLINDER

GENERAL



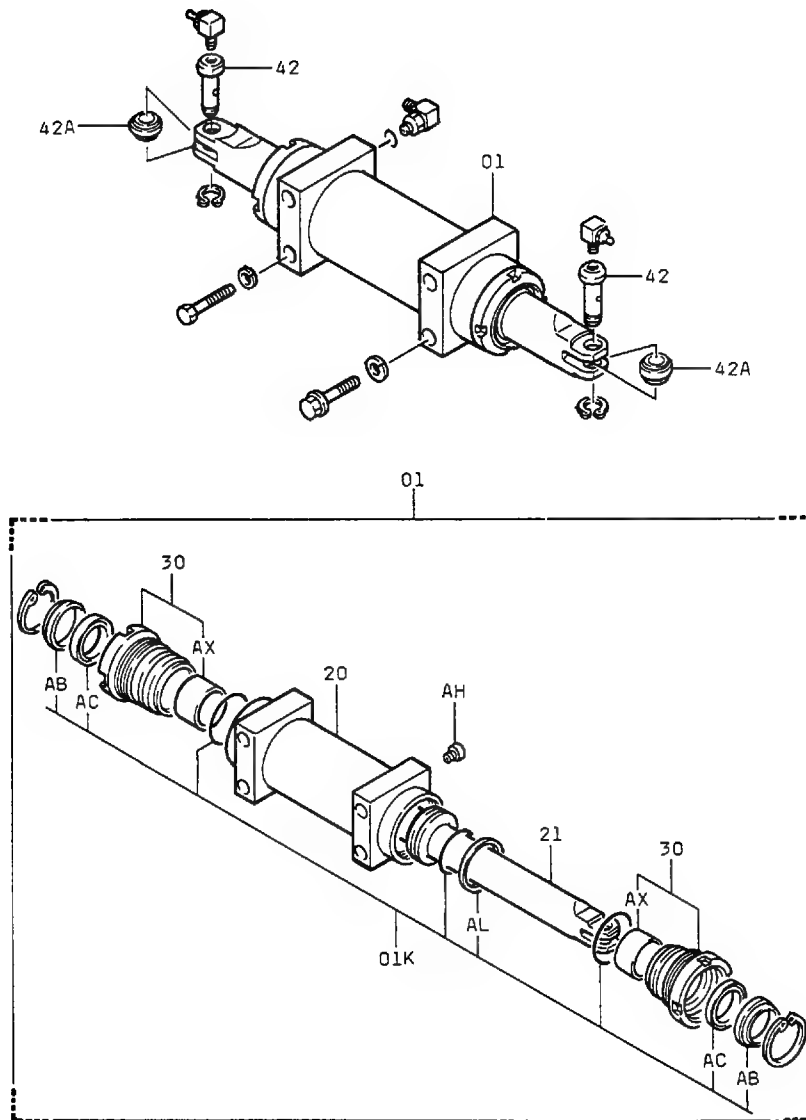
Rear Axle Cylinder Sectional View

LARM15

SPECIFICATIONS

Item	Vehicle model	1.0 ~ 1.5 ton vehicle
Rear axle cylinder type		Double action
Piston seal type		Seal ring
Rod seal type		U-packing
Piston stroke (All strok)	mm (in)	148 (5.8)
Cylinder bore	mm (in)	60 (2.4)
Piston rod diameter	mm (in)	40 (1.6)

COMPONENTS



- | | | | |
|-----|----------------------------------|-----|--------------------------------------|
| 01 | Cylinder ASSY, rear axle | 42A | Bushing (for rear axle cylinder pin) |
| 01K | Cylinder O/H kit, rear axle | AB | Seal, dust |
| 20 | Cylinder SUB-ASSY, rear axle | AC | Packing, U |
| 21 | Rod SUB-ASSY, rear axle cylinder | AH | Sleeve |
| 30 | Guide SUB-ASSY, cylinder rod | AL | Ring, seal |
| 42 | Pin, rear axle cylinder | AX | Bushing |

Rear Axle Cylinder Components

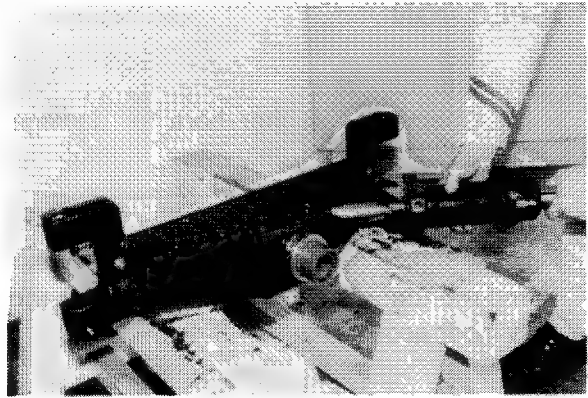
LARM19

REMOVAL

Caution:

The rear axle cylinder can not be removed and assembled unless the rear axle ASSY is removed.

See "Rear axle ASSY" for removal and assembly procedures of the rear axle cylinder.



Removing the Rear Axle Cylinder

LAR30-33

DISASSEMBLY

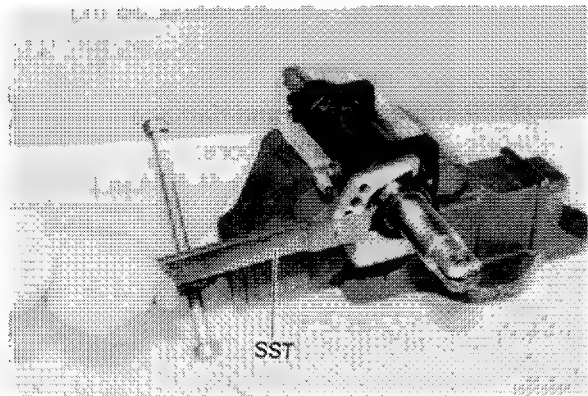
Caution:

Before disassembling, check for oil leakage, injury to piston rod, etc.

1. Remove the rear axle cylinder cover.
SST 09620-1 0100-71

Caution:

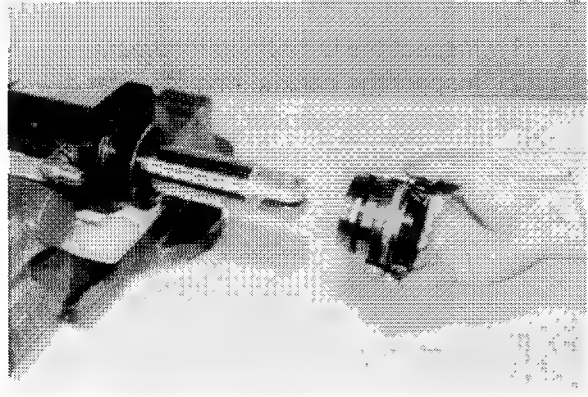
When fixing the power cylinder in a view, carefully operate to prevent deformation and damage.



Removing the Rear Axle Cylinder Cover

LAR31-25

2. Remove the rear axle cylinder guide.



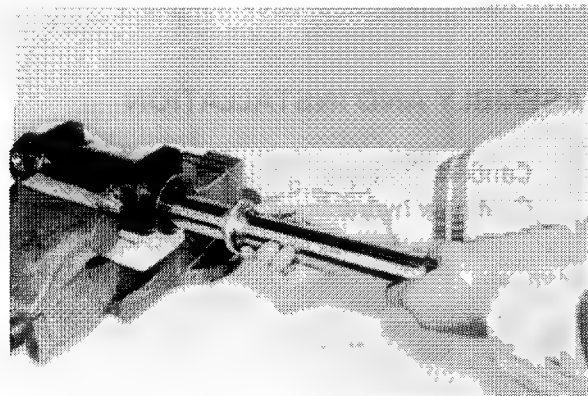
Removing the Rear Axle Cylinder Guide

LAR31-27

Extract the cylinder rod sub-assy.

Caution:

Extract the cylinder rod in parallel with the cylinder.



Extracting the Cylinder Rod

LAR31-28

INSPECTION

1. Cylinder inspection

- (1) Check the cylinder bore for damage and wear.

Caution:

Use the bore gauge and measure the wear and roundness at 200 mm (7.9 in) from the cylinder edge.

Standard cylinder bore:

60 mm (2.36 in.)

Wear limit: 60.35 mm (2.38 in.)

Piston rod inspection

- (1) Piston rod wear and damage

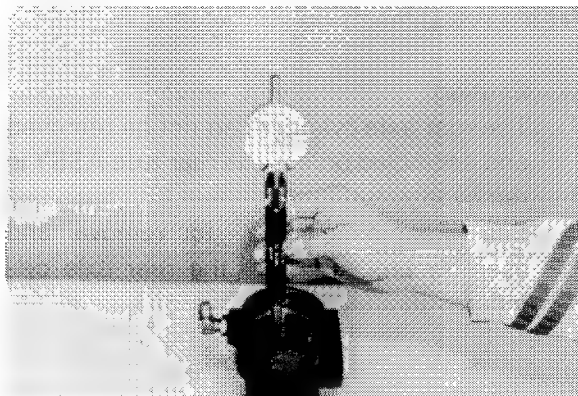
Standard cylinder bore:

40 mm (1.574 in.)

Wear limit: 39.92 mm (1.572 in.)

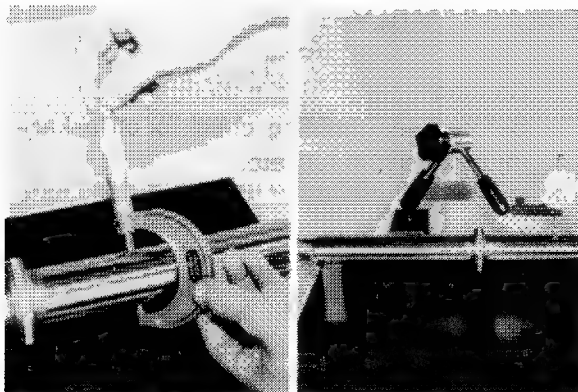
- (2) Piston rod bending

Bending limit: 1.0 mm (0.04 in)



Inspecting the Cylinder

LAR31-33

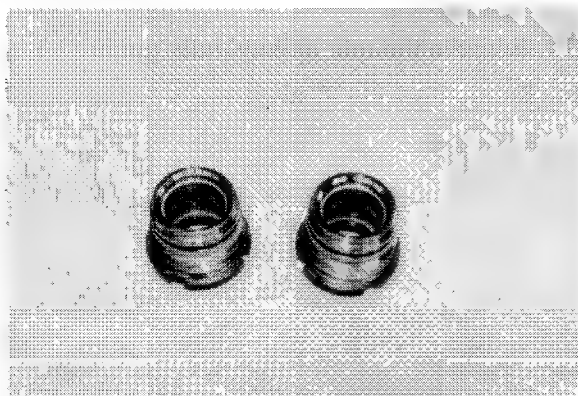


Inspecting the Piston Rod

LAR31-35.37

Cylinder rod guide inspection

- (1) Inspect the U-packing for wear.
- (2) Inspect the backup ring for wear.
- (3) Inspect the cylinder rod guide for damage.



Inspecting the Cylinder Rod Guide

LAR31-42

ASSEMBLY AND INSTALLATION

Caution:

Coat new hydraulic oil or grease sufficiently before assembly, and carefully operate.

REAR WHEEL ALIGNMENT

TOE IN

1. Put marks on the center line of both the left and right wheels.
2. Use the toe-in gauge or convex rule, and measure the distance between the tire marks (front) parallel to the ground.
 Measured value: A mm
 Then rotate tires by 1/2 turn, and measure the distance between tire marks at the rear in the same way.
 Measured value: B mm
 Toe-in = A — B
 Standard toe-in: O mm

Caution:

Adjust the tie rod positions on the left and rear sides to make them equal.

STEERING ANGLE

1. Adjust the rear wheel steering angle by screwing in or out the knuckle stopper bolt.
2. After adjusting the steering angle, check it by measuring the minimum turning radius.
 Minimum turning radius
 1.0 ton vehicle: 1645 mm (65 in.)
 1.25 ton vehicle: 1665 mm (65.5 in.)
 1.5 ton vehicle: 1700 mm (67 in.)

CAMBER, CASTER & KING PIN ANGLE

Measure the camber, caster and king pin and angles according to the wheel alignment tester handling instruction.

However, they cannot be adjusted.

Camber: 0°

Caster: 0°

King pin angle: 0°

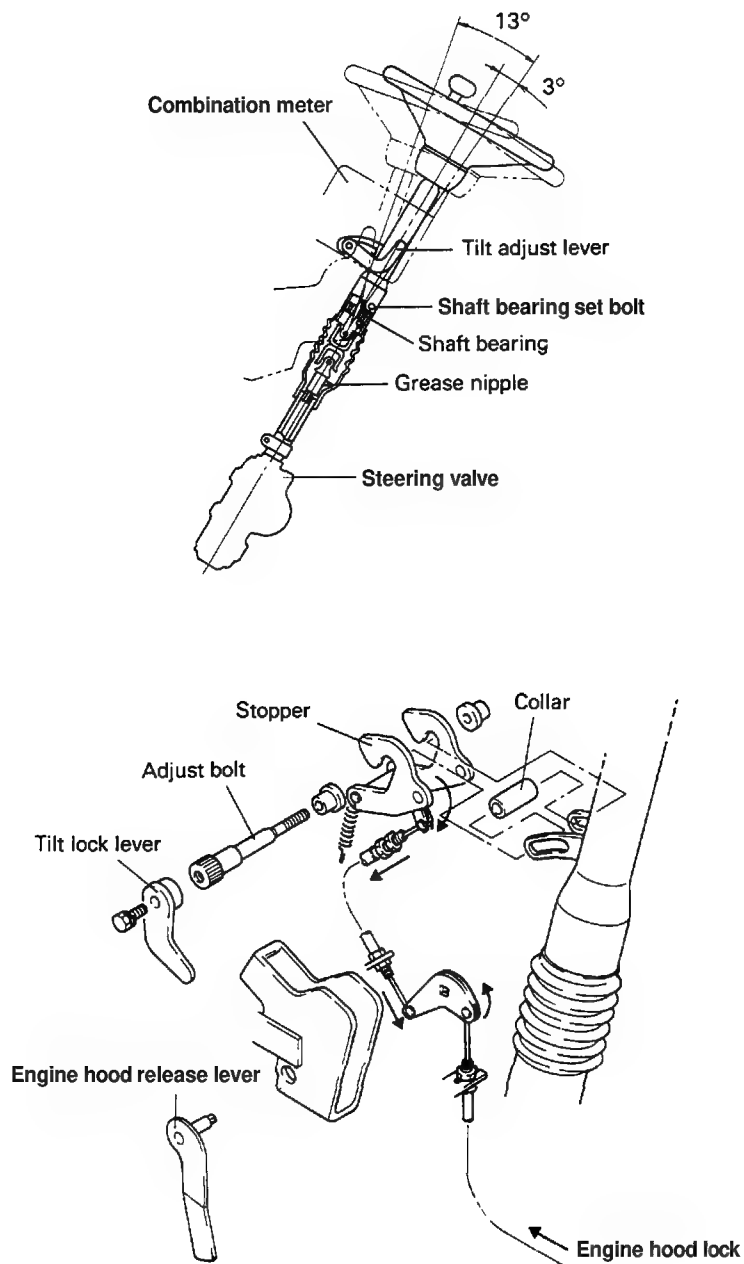
STEERING

	Page
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SPECIFICATIONS	6-6
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GENERAL	6-7
CONSTRUCTION	6-8
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DISASSEMBLY	6-28
INSPECTION	6-29
ASSEMBLY	6-30
INSTALLATION	6-31

GENERAL

The steering wheel is a $\phi 380$ mm (14.96 in) wheel allowing easy operation.

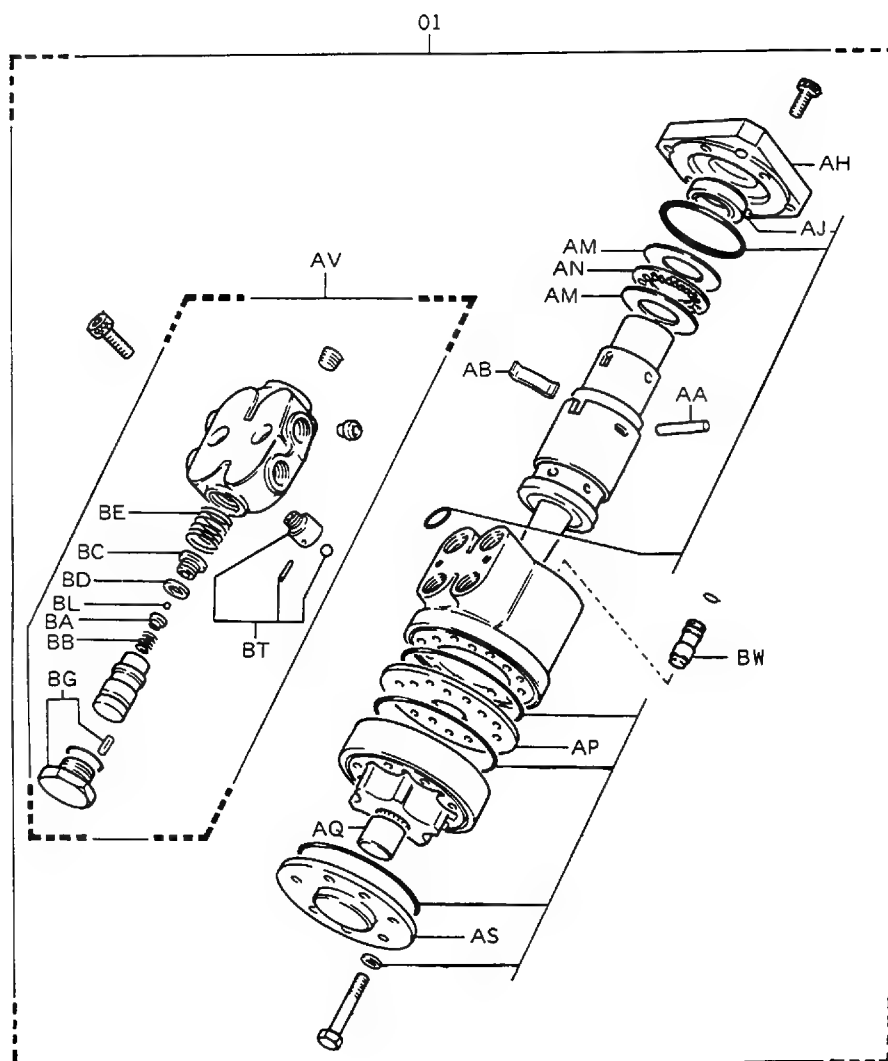
The tilt steering system is equipped as the standard to enable the operator to operate in the optimum driving position.



Tilt Steering System

LAOS246,266

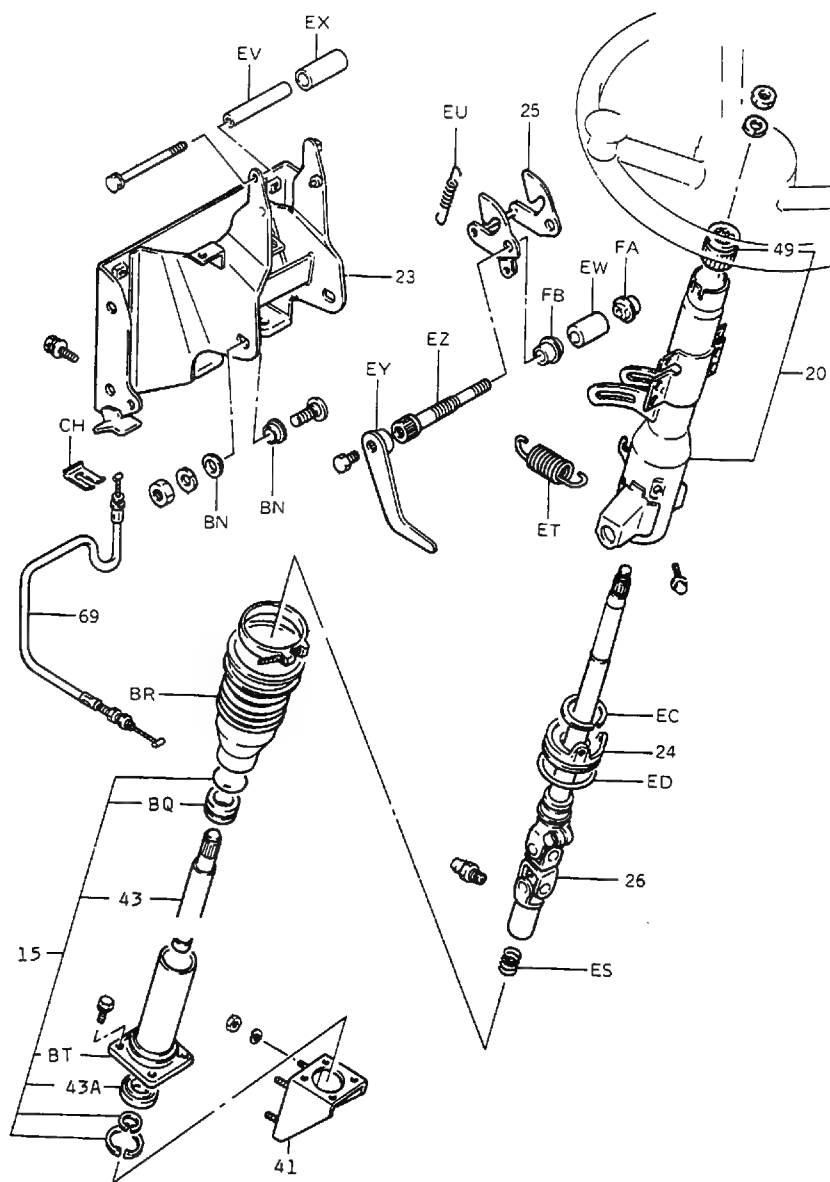
COMPONENTS



01	Valve ASSY, hydrostatic steering	AV	Valve ASSY, relief
AA	Pin, straight	BA	Retainer
AB	Spring, centering	BB	Spring
AH	Plate, mounting	BC	Valve
AJ	Packing, Y	BD	Shim
AM	Race, side	BE	Spring
AN	Bearing, needle	BG	Plug
AP	Plate, side	BL	Ball, steel
AQ	Spacer	BT	Valve ASSY, check
AS	Cap, end	BW	Valve ASSY, check

Hydrostatic Steering Valve Components

LARM20

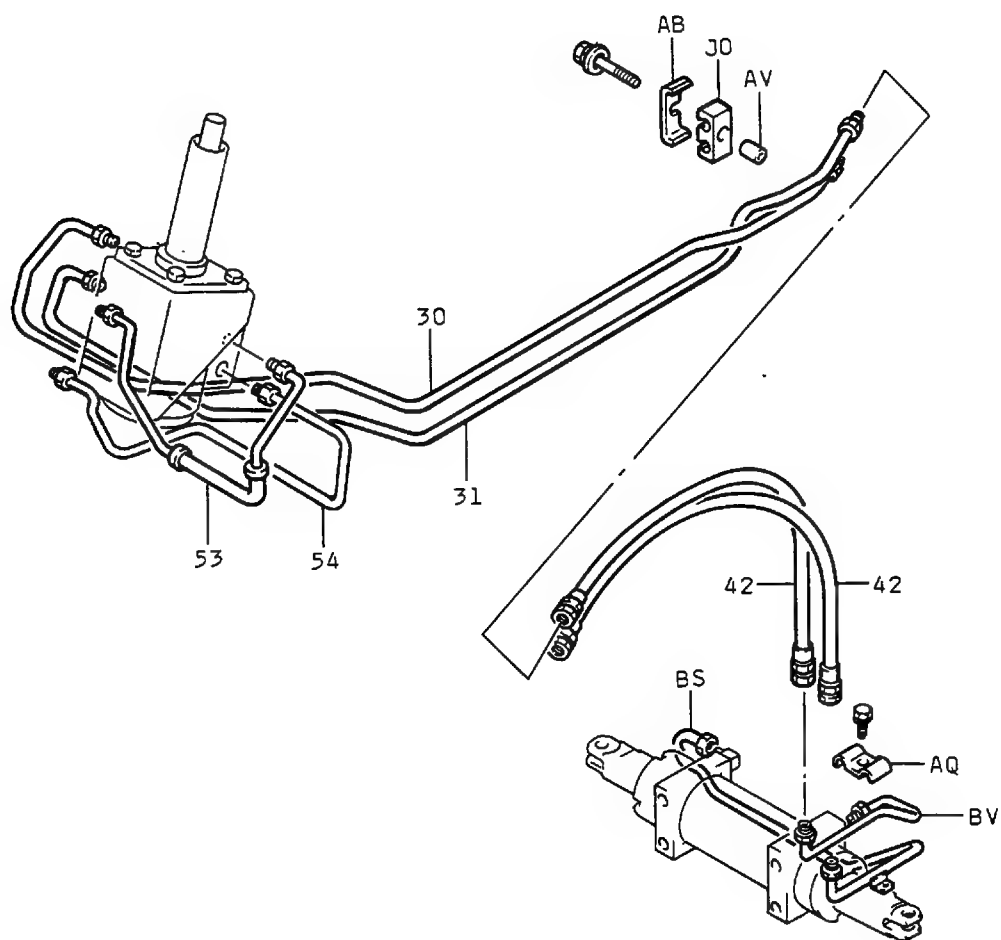


15 Post ASSY, steering
 20 Jacket SUB-ASSY, mast
 23 Bracket SUB-ASSY, tilt steering
 24 Stopper SUB-ASSY, steering shaft
 25 Stopper SUB-ASSY, steering
 26 Shaft SUB-ASSY, tilt steering
 41 Bracket, steering
 43 Shaft, steering main
 43a Bearing (for steering main shaft)
 49 Grommet, steering column (insulator)
 69 Wire, tilt steering
 BN Bushing
 BQ Bushing
 BR Boot, mast jacket

BT Jacket
 CH Clip
 EC Ring
 ED Ring
 ES Spring, compression
 ET Spring, tension
 EU Spring, tension
 EV Pipe
 EW Collar, tilt lock
 EX Hose
 EY Lever SUB-ASSY, tilt lock
 EZ Bolt, tilt lock
 FA Nut, adjusting, RH
 FB Nut, adjusting, LH

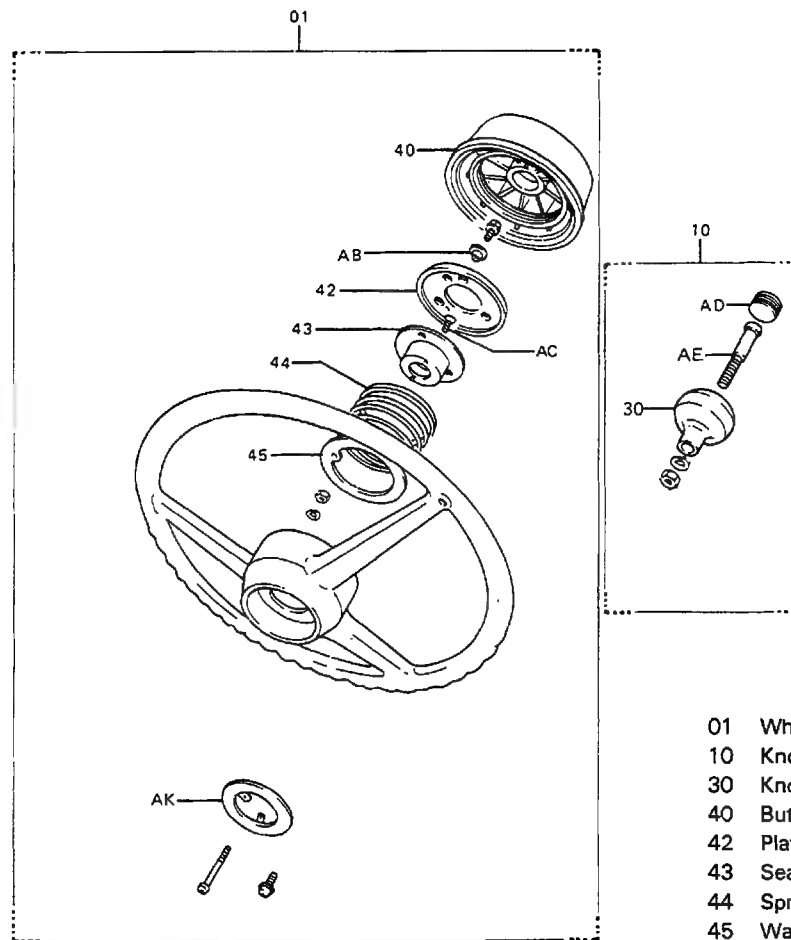
Steering Post Components

LARM21



30 Pipe SUB-ASSY, No. 1 (steering to cylinder)
 31 Pipe SUB-ASSY, No. 2 (steering to cylinder)
 42 Hose, power cylinder, No. 1
 53 Hose, high pressure
 54 Hose, high pressure
 AB Clamp, pipe

AQ Clamp
 AV Pipe
 BS Pipe SUB-ASSY, power cylinder
 BV Pipe SUB-ASSY, power cylinder
 JO Rubber, cushion



- 01 Wheel ASSY, steering
- 10 Knob ASSY, steering wheel
- 30 Knob SUB-ASSY, steering wheel
- 40 Button, horn
- 42 Plate, horn contact
- 43 Seat, horn contact
- 44 Spring, horn contact
- 45 Washer
- AB Washer
- AC Screw
- AD Cap, steering wheel
- AE Bolt, steering wheel knob set
- AK Ring, horn contact No. 1

Steering Wheel Components

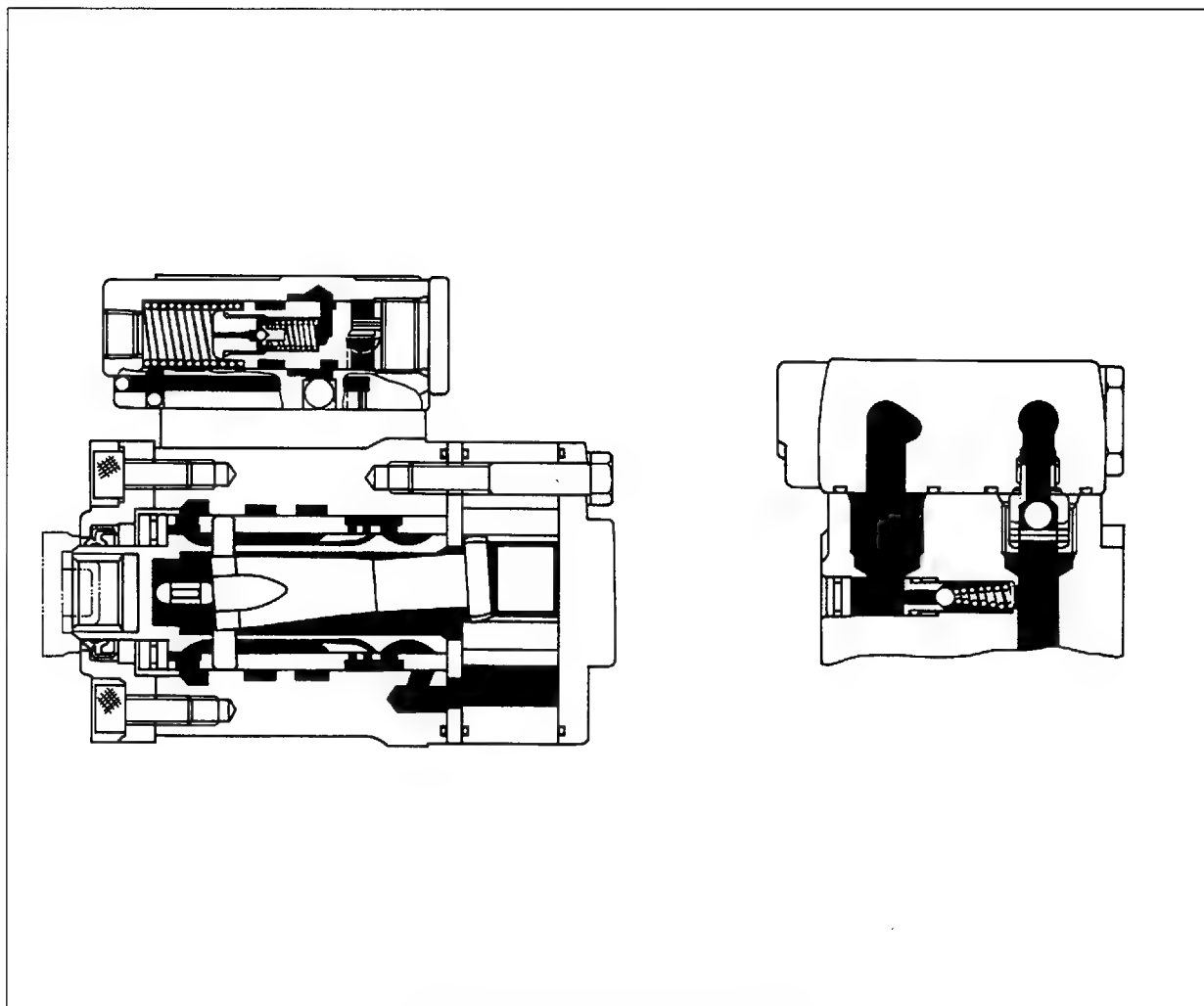
LARM

SPECIFICATIONS

Item		Vehicle model	1.0 ~ 1.5 ton vehicle
Steering wheel	Diameter	mm (in)	φ380 (14.96)
	Play	mm (in)	At idling 20 ~ 40 (0.8 ~ 1.6)
Power steering type			Hydrostatic power steering
Hydrostatic steering valve	Displacement	cc/rev (in ³ /rev)	50 (3.1)
	Relief valve set pressure	kg/cm ² (psi)	55 ~ 65 (782.0 ~ 924.3)
	Maximum input torque	kg-m (ft-lb)	12 (86.6)
Relief valve type			Built-in type

HYDROSTATIC STEERING VALVE

GENERAL



Hydrostatic Steering Valve Sectional View

SAAM56

The hydrostatic steering valve consists of the rotary valve, gyrotor and relief valve.

1. rotary valve

The rotary valve consisting of the sleeve and spoon selects the oil path by rotation. The valve body has four ports connected to the pump circuit, tank circuit, and left and right power cylinder chambers, respectively. A check valve operating at the time of manual steering exists between the P and T ports, and a flow check valve for kickback prevention is provided at the P port.

2. Gyrotor (metering mechanism)

The gyrotor consists of the internal gear type stator and external gear type rotor. It operates as an oil motor during normal operation, and as a hand pump in an emergency. The rotor is mechanically connected to the sleeve via the drive shaft to provide a feedback action.

3. Relief valve

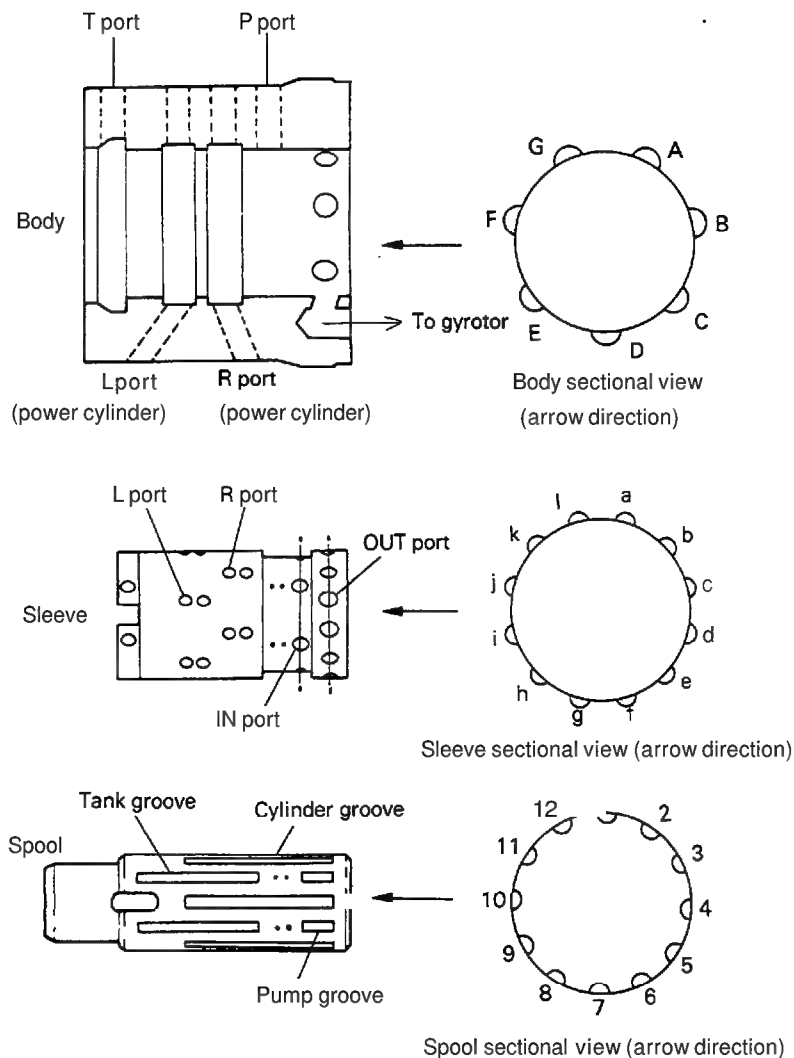
The relief valve controls the hydraulic oil entering the P port of the valve body to a constant pressure. The relief valve is available in the built-in type and devided type.

CONSTRUCTION

The spool housed in the sleeve in the rotary valve is connected to the steering main shaft, and rotates with the steering wheel.

The spool in the sleeve is stopped by a straight pin to limit the relative angular displacement to a fixed level (approx. 10°). In other words, the spool rotates individually to the fixed level and rotates with the sleeve after that limit is reached. A centering spring is installed between the spool and sleeve to maintain the relative positioning of the spool and sleeve at neutral and give the steering reaction force.

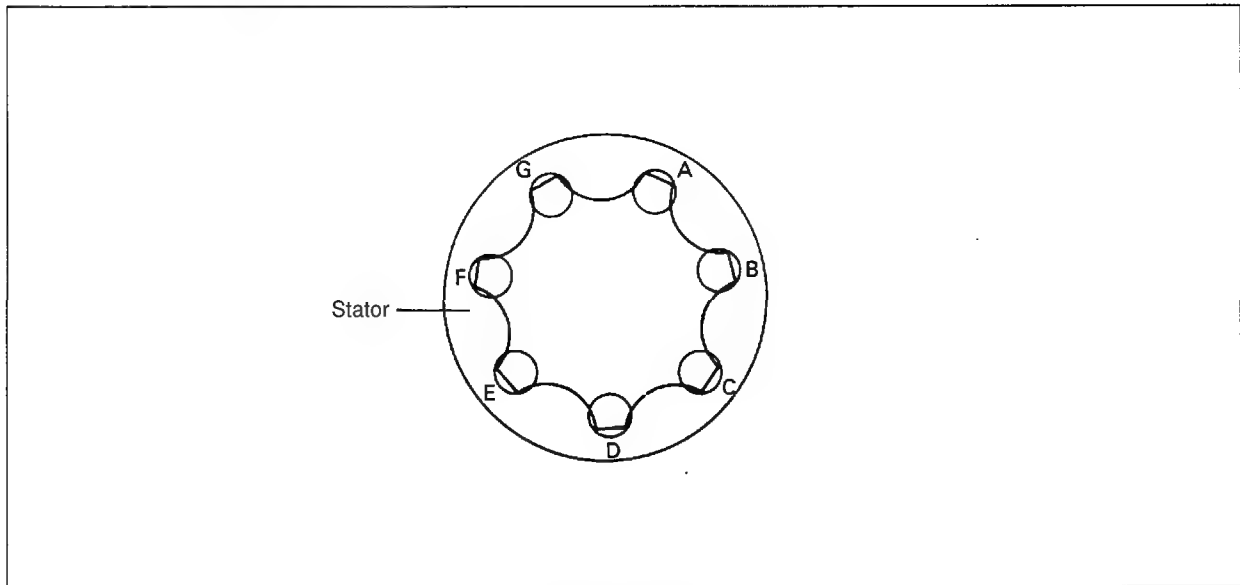
The drive shaft in the spool is connected to the straight pin at one end and to the gyrotor rotor at the other end to connect the sleeve and rotor for transmitting the rotor rotation to the sleeve.



Rotary Valve Port Positions

BAHS43

Gyrotor Port Positions



Gyrotor Port Positions

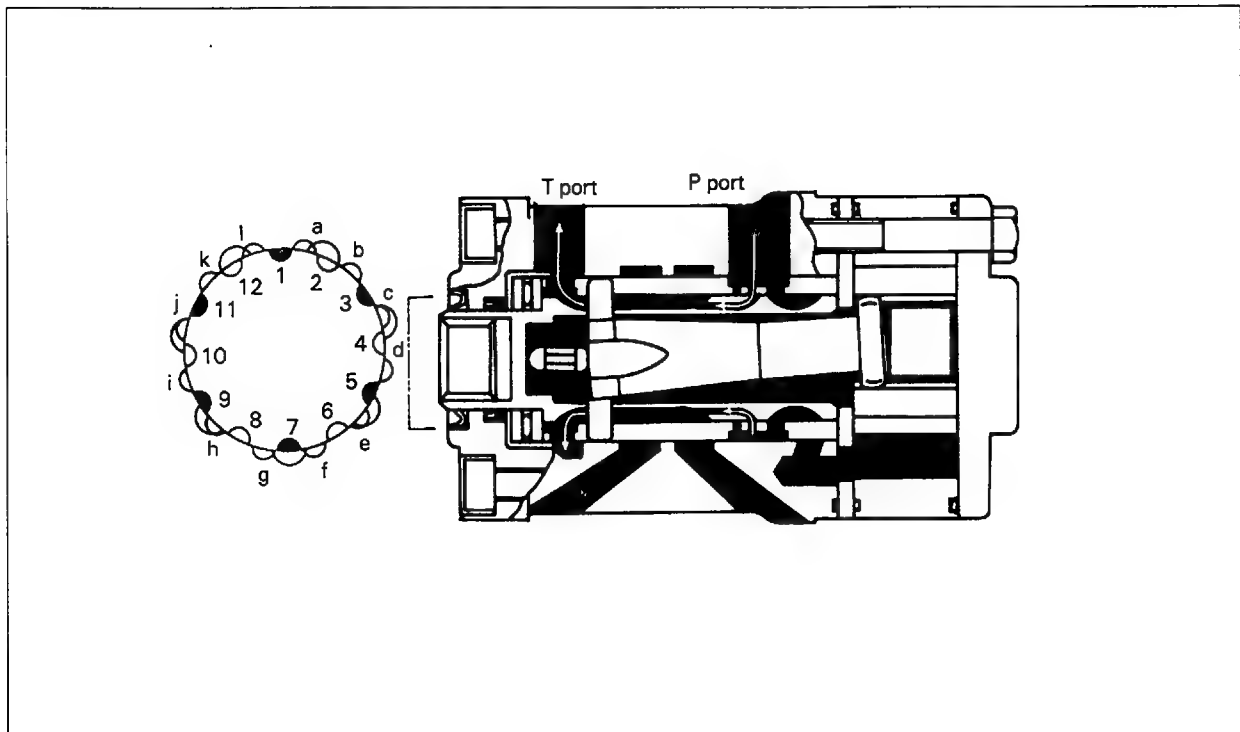
BAHS44

FUNCTION

At Neutral

The hydraulic oil entering the body P port acts on six pump grooves (1, 3, 5, 7, 9 and 11) of the spool. Since the spool pump grooves and the sleeve ports do not match, no oil flows in and the power cylinder is not operated.

The hydraulic oil entering the body P port, as shown as right in the figure below, passes the small holes in the sleeve and spool to lubricate the drive shaft, and returns through the body T port to the tank.



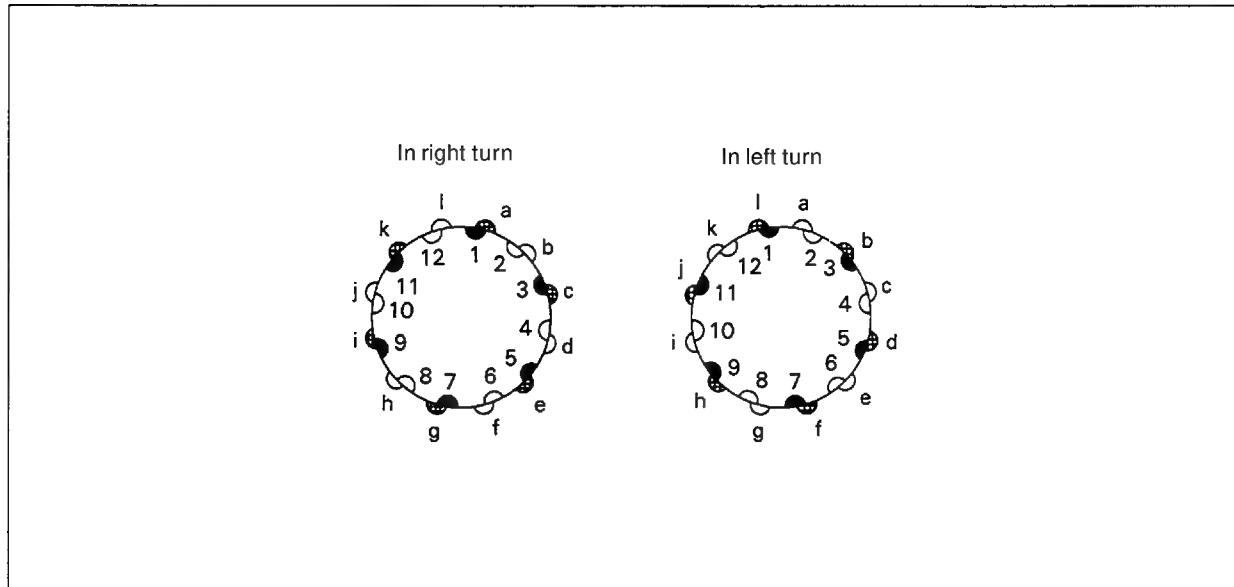
Operation at Neutral

BAHS45

During Turning

Relation between spool and sleeve during turning

When the steering wheel (connected to the spool) is rotated for turning, the spool rotates because the sleeve is fixed by the rotor. Spool pump grooves (1, 3, 5, 7, 9 and 11) match sleeve ports (a, c, e, g, i and k) during a right turn or sleeve ports (l, b, d, f, h and j) during a left turn, respectively.



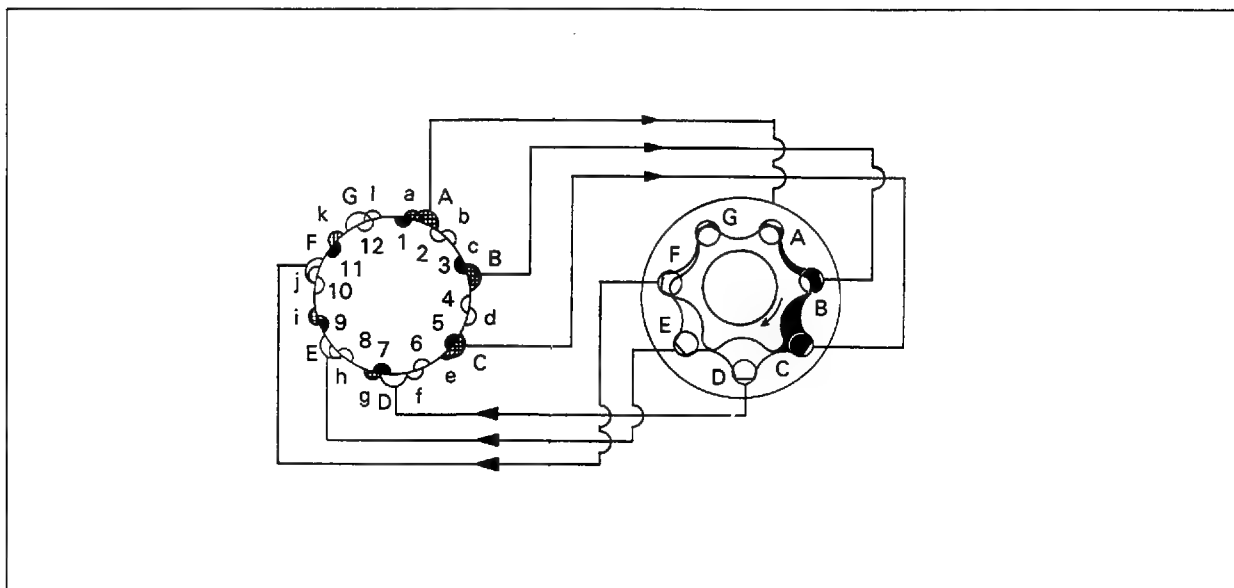
Sleeve and spool Operating Positions during Turning

BAHS46

During Right Turn

The port relationships of the spool, sleeve and body during a right turn is as shown in the figure below. During a right turn, spool and sleeve ports (1-a, 3-c, 5-e, 7-g, 9-i and 11-k) are connected to circuit ports (A, B and C) to the body gyrotor.

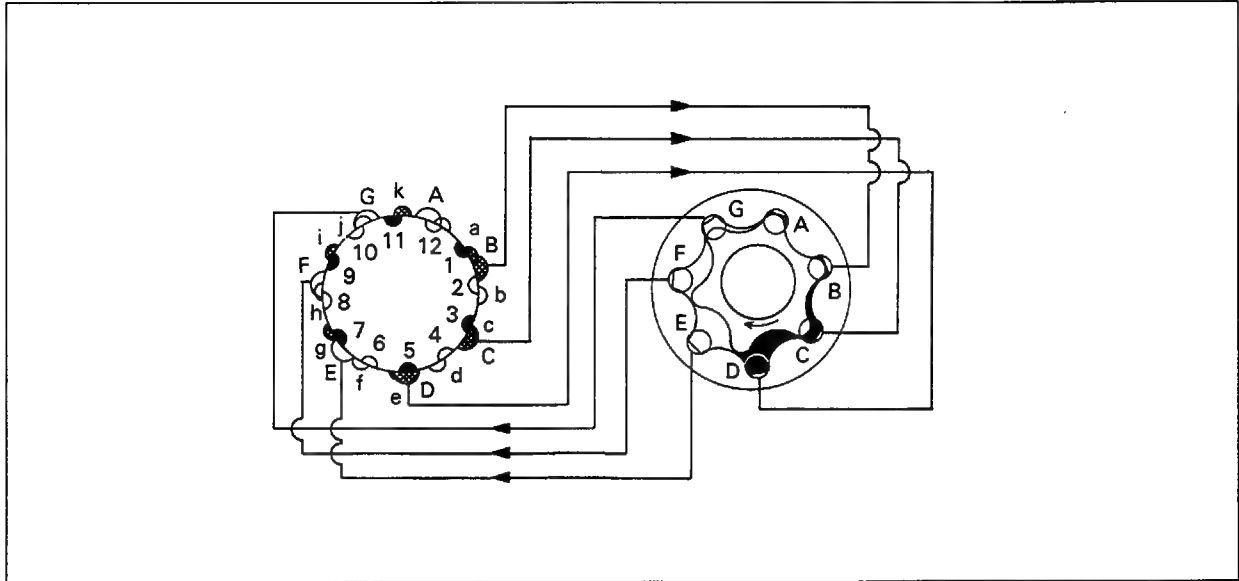
The hydraulic oil from the oil pump flows through each connected port to the gyrotor to turn the rotor clockwise as illustrated below. At the same time, the circuit ports (D, E and F) from the body gyrotor are connected to the power cylinder circuit to operate the power cylinder.



Operation during Right Turn (Initial Stage)

BAHM45

As the steering wheel is turned further, the spool and sleeve, with their ports connected (1-a, 3-c, 5-e, 7-g, 9-i and 11-k), are rotated with the rotor in the body. The circuit ports change the order of A, B and C → B, C and D, and the circuit ports to the cylinder also change from D, E and F to E, F and G to operate the power cylinder further.



Operation during Right Turn (Upon One Tooth Shift)

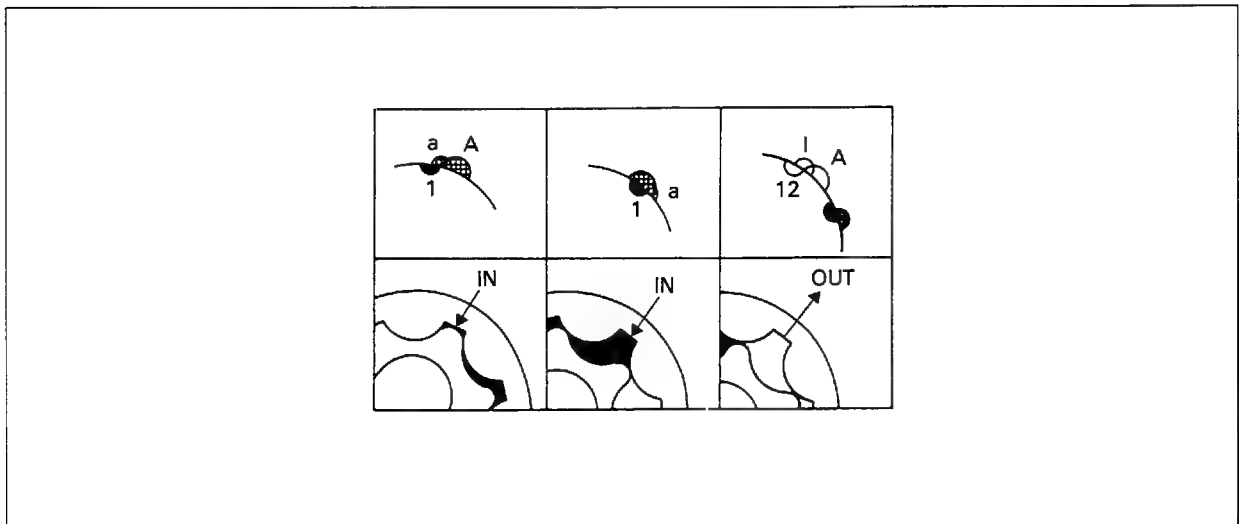
BAHM46

When checking the body A port during a right turn in details, the oil path is as shown below.

- I Spool 1 → sleeve a → body A → gyrotor (inflow) (small flow rate)
- II Spool 1 → sleeve a → body A → gyrotor (inflow) (large flow rate)
- III Gyrotor → body A → sleeve 1 → spool 12 (discharge) (to PS cylinder)

Note:

In the state of III, spool 1 and sleeve a advance to a position irrelevant to the A port.



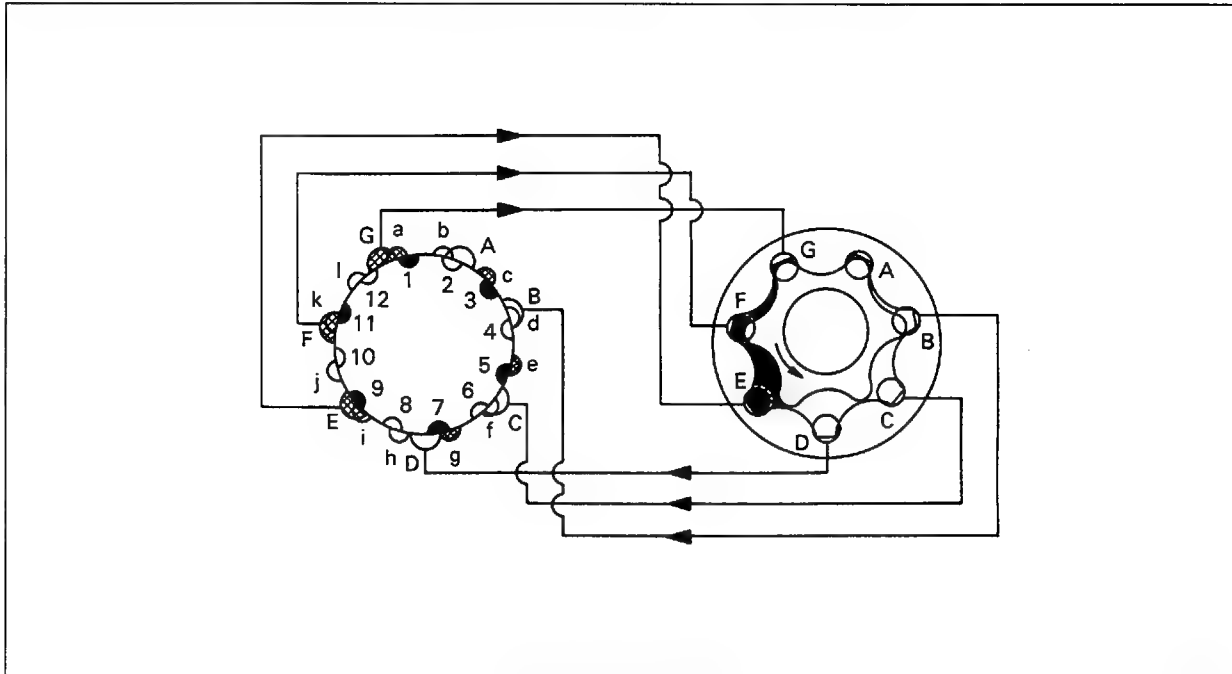
Details of Body A Port

BAHS47

As shown above, the body ports applied where the hydraulic oil from the pump acts on sequentially change in the order of A, B, C → B, C, D → C, D, E and so forth as the steering wheel rotates. The rotor turns clockwise to change the oil paths to the PS cylinder sequentially in the order of D, E, F, G → E, F, G → F, G, A and so forth for smooth oil supply to the cylinder.

During Left Turn

The operator for a left turn is similar to that in the right turn as illustrated below.



Operation during Left Turn

BAHM47

Steering when the oil pump is defective

When the oil pump becomes defective to stop hydraulic oil supply, the hydrostatic steering valve structurally operates as a manual steering system.

When the steering wheel is turned, the rotary valve spool is rotated by the steering main shaft to turn the drive shaft by contact with the straight pin.

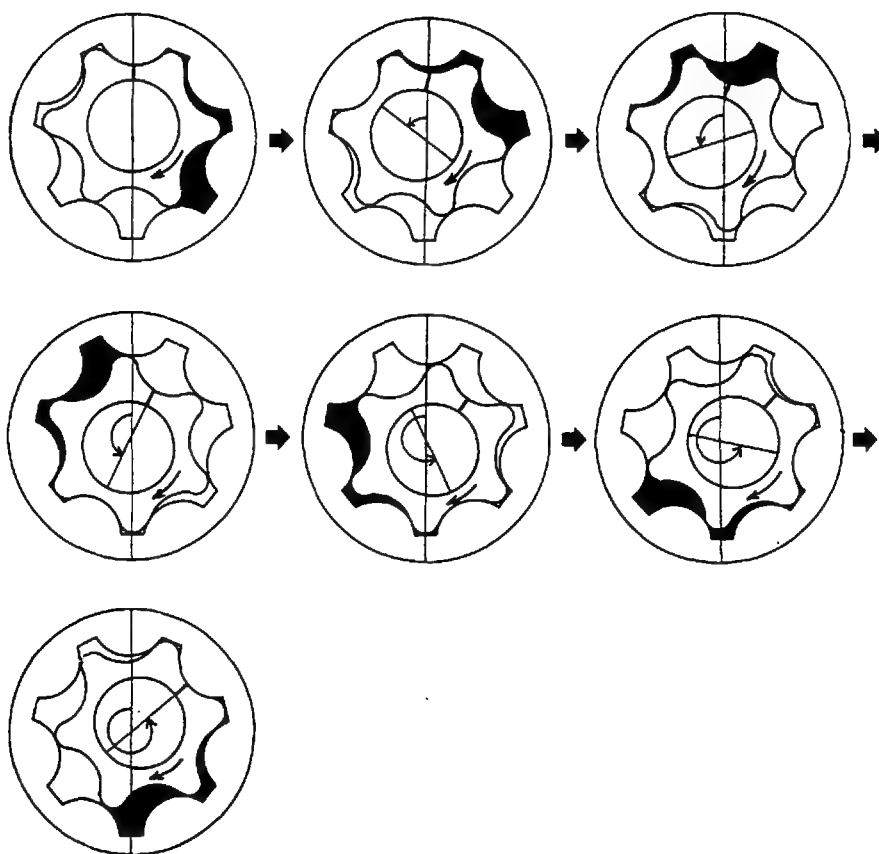
As the drive shaft rotates, the rotor linked by spline connection also rotates. The gyrotor operates as the hand pump to supply oil to the power cylinder.

The checkvalve provided between the tank port and pump port is opened to let the oil flow from the tank to the pump to enable manual steering in an emergency. (The steering operation in this state is very heavy.)

The input torque from the steering wheel shall be limited to 12 kg-cm (86.6 ft-lb) or less.

Rotor Rotation and Discharge Rate

When the steering wheel is turned to the right, the rotor rotates clockwise but the rotor movement by the hydraulic oil appears as if it were a counterclockwise turn while it makes a clockwise turn by one tooth ($1/7$ turn). The locus drawn by the center of the rotor is a counterclockwise circular locus. As the rotor rotates clockwise and moves incircling the body to $1/7$, the locus of the center of the rotor makes a $6/7$ turn. When the steering wheel makes one turn, the rotor center locus becomes 6 turns. In other words, one steering wheel (rotor) revolution realizes oil exchange for 42 chambers (6×7).



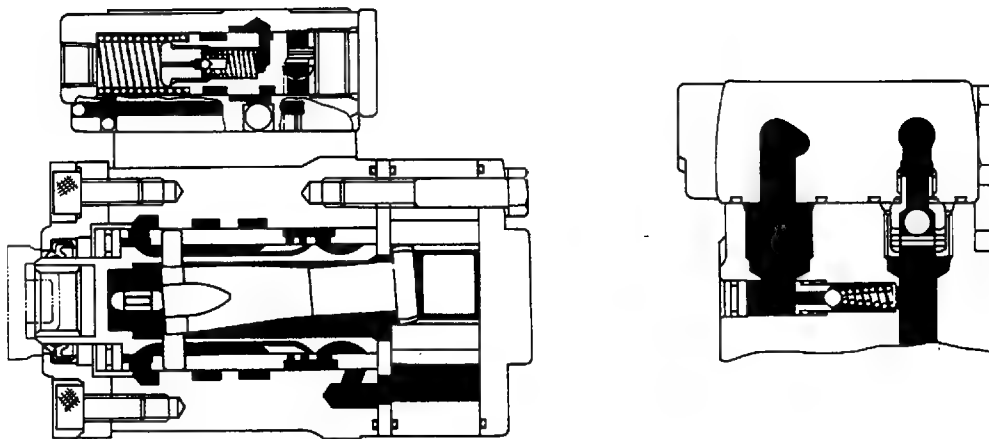
Rotor Movement during $1/7$ Rotor Revolution

8AHM48

RELIEF VALVE

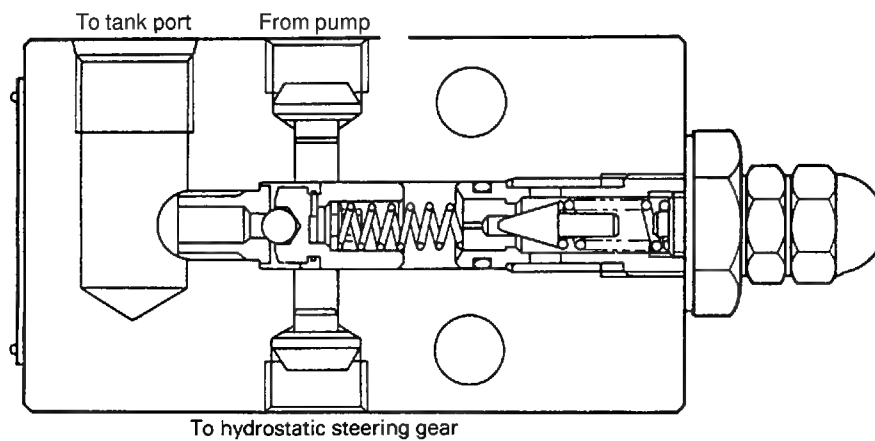
The relief valve comes in two types, the one built in the hydrostatic steering valve and the divided type. The built-in type adjusts the hydraulic oil entering the P port to the relief set pressure and feeds it to the hydrostatic steering valve.

The divided type valve is located in the hydraulic circuit between the brake valve. It adjusts the hydraulic oil entering the P1 port to the relief set pressure and supplies it to the P2 port.



Relief Valve Sectional View (Built-in Type)

SAAMS56



Relief Valve Sectional View (Divided Type)

KADS1

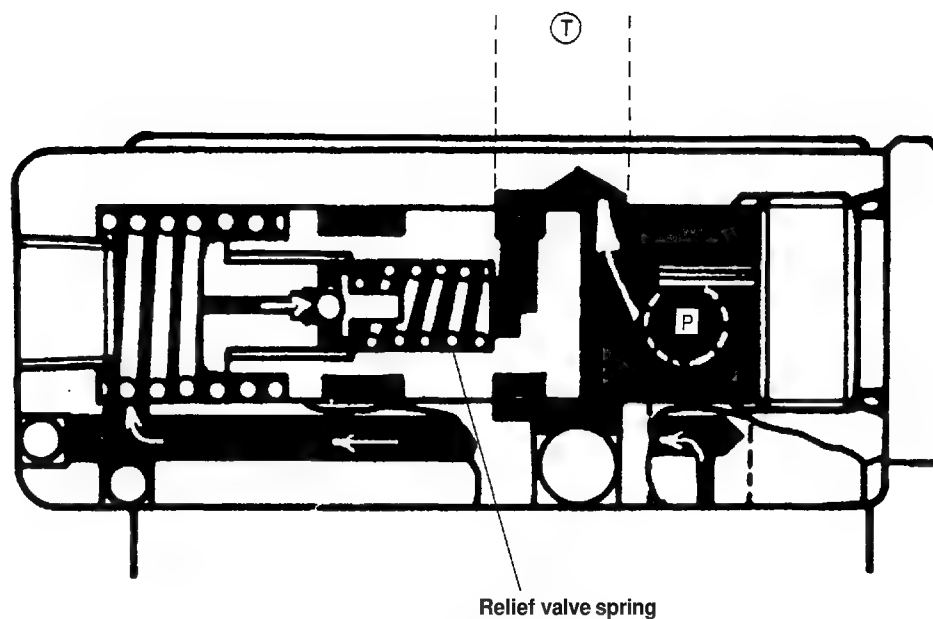
Operation at Relief

Built-in Type

When the rear wheels are locked, this type operates as the relief valve. The hydraulic oil from the oil pump enters the P port to act on the right side of the valve and also on the left side of the valve through the orifice. Immediately before the relief, the valve is balanced because the pressure on the right side equals the pressure on the left side and the spring force. When the relief pressure is reached, the hydraulic pressure on the left side opens the steel ball to relieve the oil to the T port. The balance between the left and right is lost and the valve moves leftward. As a result, the P port and T port are directly connected to keep the pressure within the relief set pressure.

Divided Type

Refer to the relief valve operation described in the Flow Divider & Relief Valve section.



Relief Valve Operation

BAHS48

REMOVAL

Note:

Check the following points before removing the steering valve **ASSY**

- Isn't steering heavy?
- Isn't oil leaking?
- Is the relief pressure proper?
- Isn't there any damage in the links including the power cylinder?
- * If any abnormality is found in the above check, remove the steering valve **ASSY** after roughly determining the steering valve **ASSY** after roughly determining the abnormal point.
- Does the vehicle travel straight?
- Is steering operation smooth?

Remove the steering wheel

- (1) Horn wire
- (2) Horn button
- (3) Horn contact plate set bolts, washer
- (4) Horn contact plate
- (5) Spring
- (6) Set nuts, spring washers
- (7) Horn contact seat screw
- (8) Horn contact seat
- (9) Matching marke
- (10) Steering wheel

SST 09609-2001 1

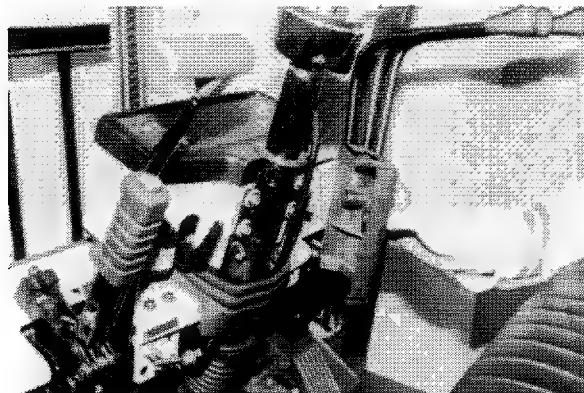


Removing the Steering Wheel

LAR33-35

Remove the combination meter cover

- (1) Set screw
- (2) Cover

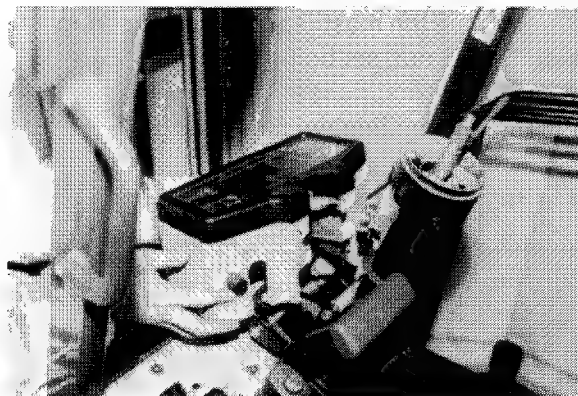


Removing the Cover

LAR33-39

Remove the combination meter ASSY

- (1) Set bolts
- (2) Connect
- (3) Combination meter ASSY



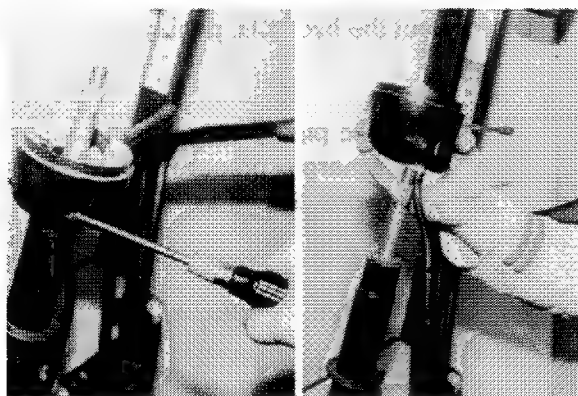
Removing the Combination Meter ASSY

LAR34-6

4. Remove the turn signal switch ASSY

- (1) Set bolt
- (2) Turn signal switch ASSY

5. Remove the boot



Removing the Turn Signal Switch

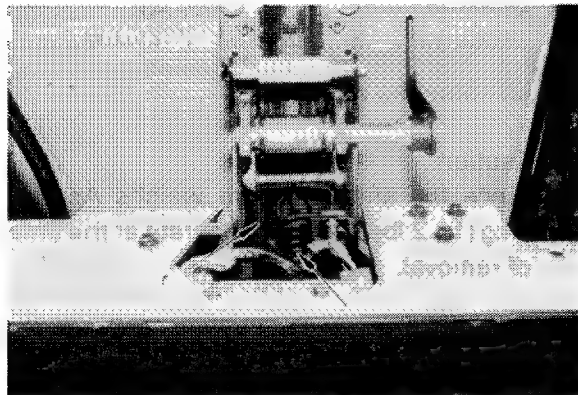
LAR34-7,8

Remove the return spring

- (1) Spring, small (for steering stopper)
- (2) Spring, large (for steering post)

Caution:

Carefully operate because the spring force is strong.



Removing the Spring

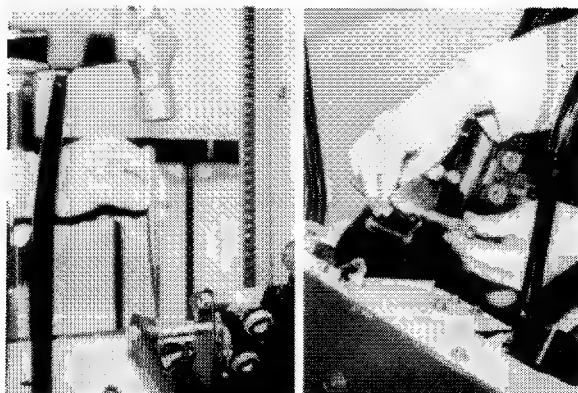
LAR34-13

Remove the tilt lock mechanism

- (1) Matching mark
- (2) Set bolt
- (3) Tilt lock lever
- (4) Tilt lock bolt
- (5) Adjusting nut (LH)
- (6) Tilt lock collar
- (7) Adjusting nut (RH)

Caution:

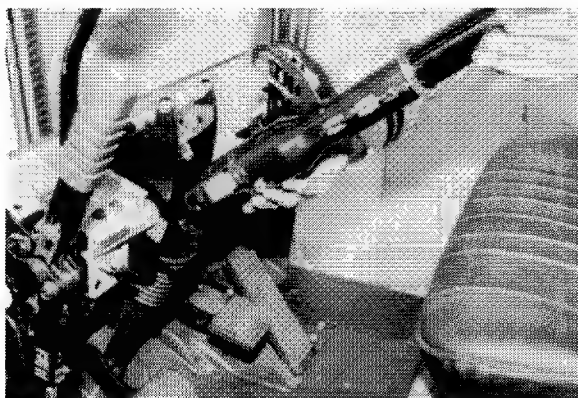
The adjusting nut LH uses righthand screw, and the adjusting nut RH left-hand screw.



Removing the Tilt Lock Mechanism

LAR34-16,16

8. Remove the mast jacket w/ tilt steering
 - (1) Set nut, set bolt
 - (2) Bush
 - (3) Mast jacket w/ tilt steering.
9. Remove the toe-board



Removing the Mast Jacket

LAR34-20

10. Disconnect the hydraulic piping

Caution:

Since hydraulic piping connection causes slight oil discharge, prepare waste cloth around the hydraulic piping.

- (1) Inlet pipes
- (2) Outlet pipes



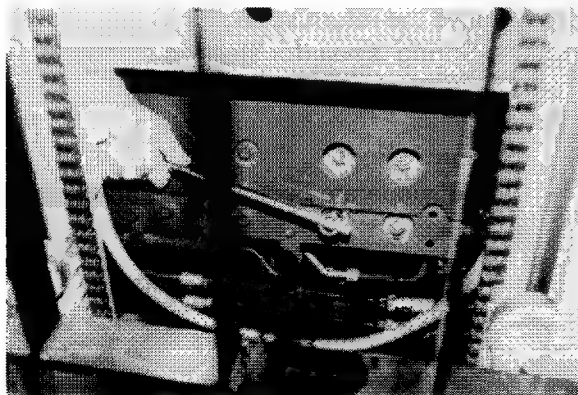
Disconnecting the Hydraulic Piping

LAR34-24

11. Remove the steering valve ASSY
 - (1) Set bolts
 - (2) Steering valve ASSY

Caution:

Since the steering valve weighs Approx. 6 kg (13.2 lbs), carefully operate at the time of removal.

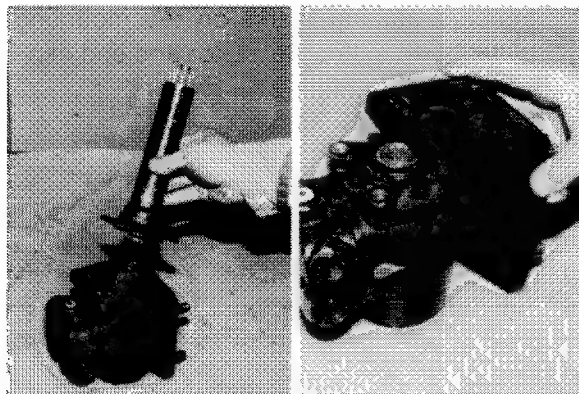


Removing the Steering Valve ASSY

LAR34-26

DISASSEMBLY

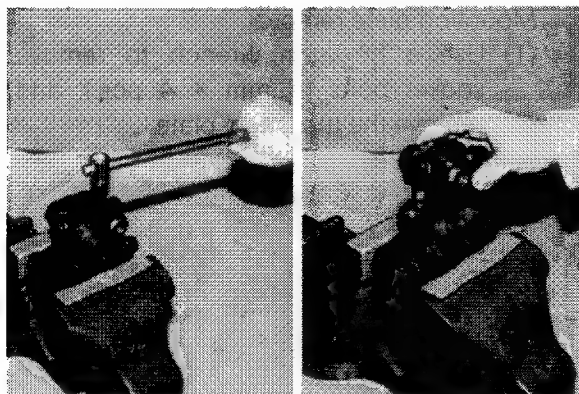
1. Mast jacket and steering bracket removal
 - (1) Use a spanner to remove set bolts (4 pcs.), and remove the mast jacket and steering bracket.



Removing the Mast Jacket and Steering Bracket LAP7-5,6

Relief valve ASSY removal

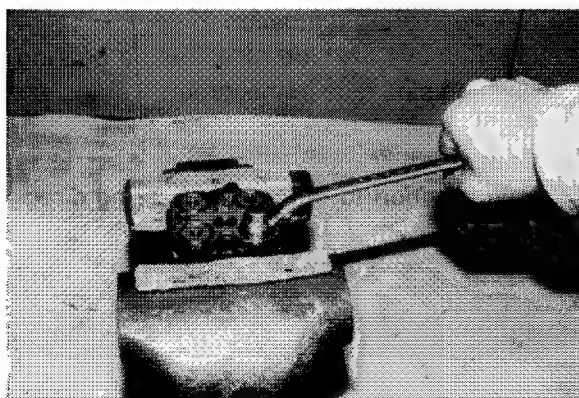
- (1) Fix the hydrostatic steering valve in a vise, and use a hexagon wrench to remove socket bolts (8 mm (0.3in) × 2 pcs.).
- (2) Remove the relief valve ASSY.



Removing the Relief Valve ASSY LAW-7.8

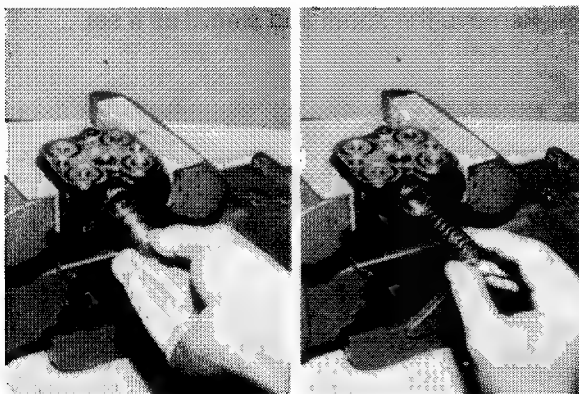
Relief valve ASSY disassembly

- (1) Fix the relief valve ASSY in a vise.
- (2) Use a ring spanner to remove the check valve.



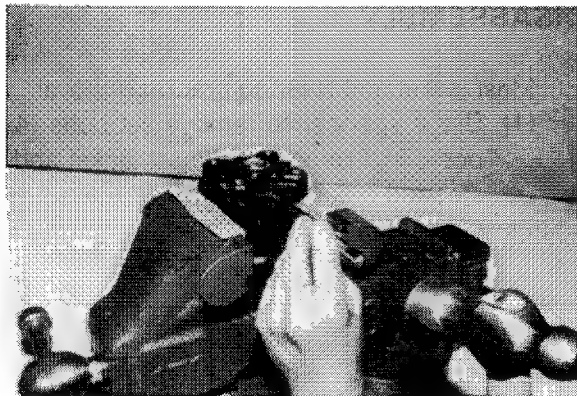
Removing the Check Valve LAP7-11

- (3) Remove the plug with a spanner, and remove the relief valve and spring.
 - ① Plug
 - ② Relief valve
 - ③ Spring



Remove the Relief Valve LAP7-14,15

Punch matching marks on the mounting plate, body, side plate, stator and end cap.

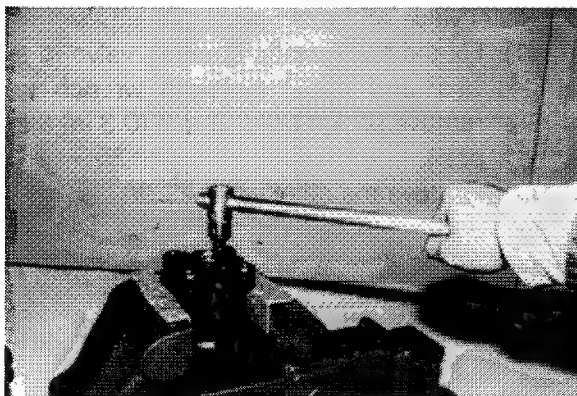


Punching the Matching Marks

LAP7-17

Mounting plate removal

- (1) Use a hexagon wrench to remove socket bolts (6 mm × 4 pcs.), and remove the mounting plate.



Removing the Mounting Plate

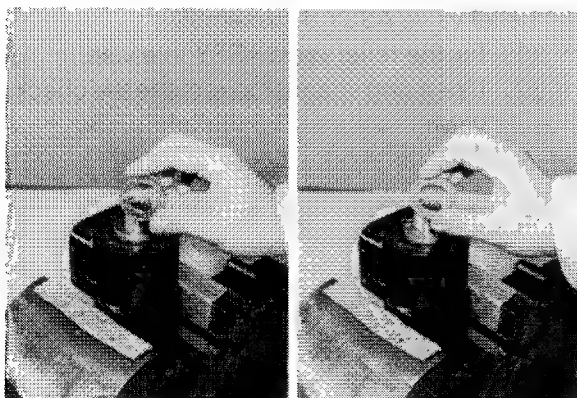
LAP7-18

Needle bearing removal

- (1) Remove the side race, needle bearing and side race in this order.

Caution:

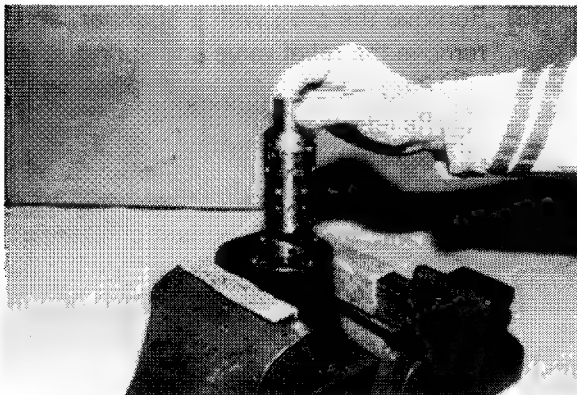
Pay attention to the needle bearing direction.



Removing the Needle Bearing

LAP7-28,29

7. Remove the spool and sleeve as a set.

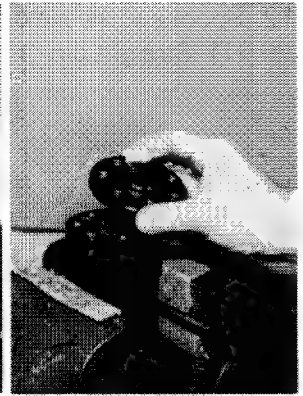


Removing the Sleeve

LAP7-30

8. End cap removal

- (1) Use a ring spanner to remove the set bolts (7 pcs.), and remove the end cap.



Removing the End Cap

LAP7-32,33

9. Rotor removal

- (1) Spacer
- (2) Rotor

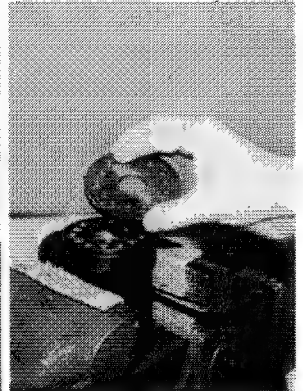


Removing the Rotor

LAP7-35,36

10. Stator and side plate removal

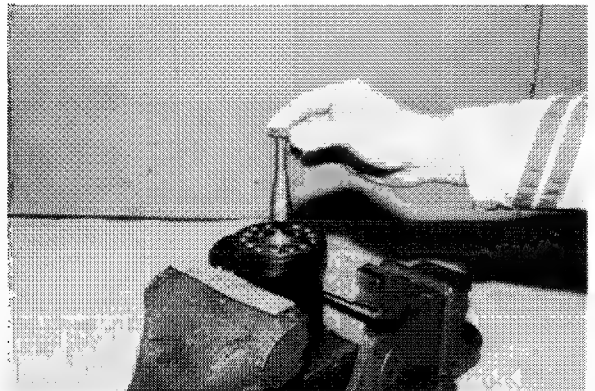
- (1) Stator
- (2) Slide plate



Removing the Stator

LAPS-1.2

11. Drive shaft removal

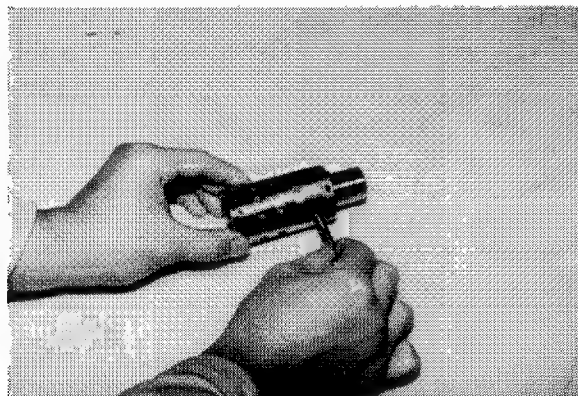


Removing the Drive Shaft

LAP8-3

12. Spool and sleeve disassembly

(1) Straight pin



Removing the Straight Pin

LAP8-4

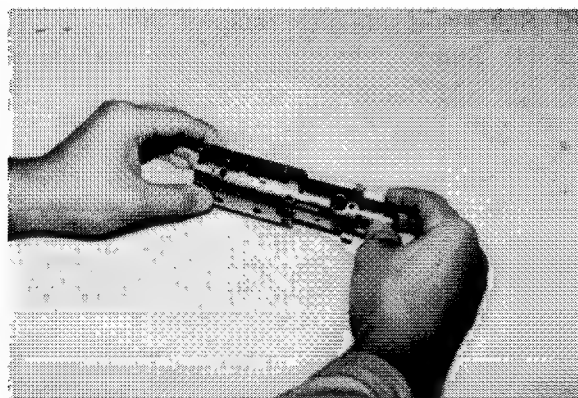
(2) Centering spring



Removing the Spring

LAPS-8

(3) Extract the spool from the sleeve.

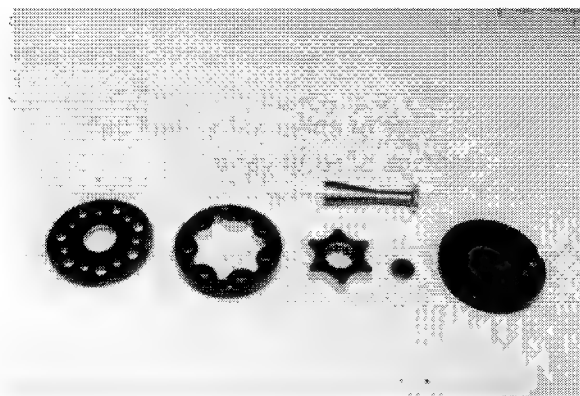


Extracting the Spool

LAP8-5

INSPECTION

1. Gyrotor inspection
 - (1) Sticking and damage of stator and side plate
 - (2) Sticking and damage of rotor
 - (3) Damage of drive shaft

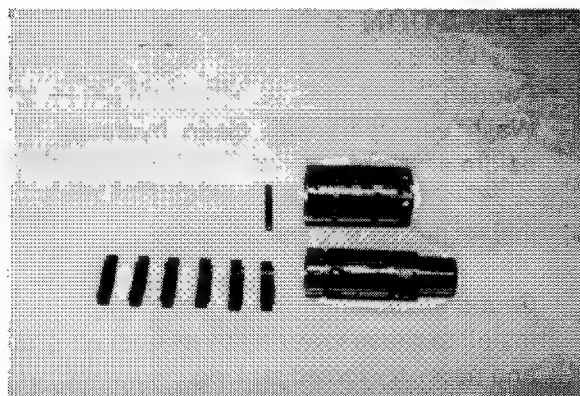


Inspecting the Gyrotor

LAP8-6

Spool and sleeve inspection

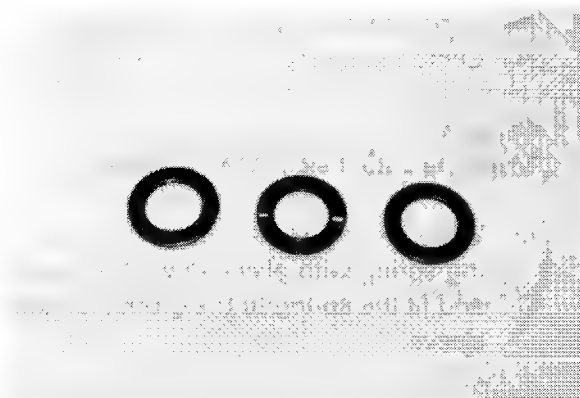
- (1) Sticking and damage of sleeve, and clogging of each port
- (2) Sticking and damage of sleeve, and clogging of each port
- (3) Crack, damage and weakening of centering spring.



Inspecting the Spool and Sleeve

LAP8-9

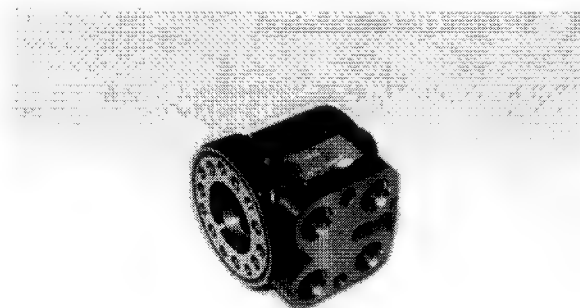
3. Needle bearing inspection
 - (1) Damage of needle bearing
 - (2) Damage of side race and cage



Inspecting the Needle Bearing

LAP8-13

4. Valve body inspection
 - (1) Damage on valve body bore
 - (2) Damage on gyrotor mounting surface
 - (3) Clogging of each port

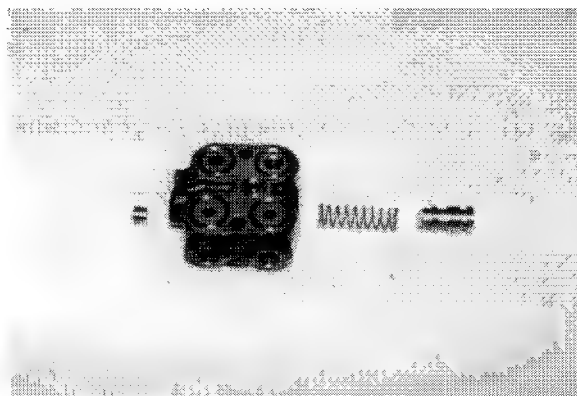


Inspecting the Valve Body

LAP8-14

Relief valve ASSY inspection

- (1) Damage on relief valve body joint surface
- (2) Damage of check valve steel ball
- (3) Damage of relief valve
- (4) Damage of spring



Inspecting the Relief Valve ASSY

LAW-18

INSTALLATION

Caution:

Wash each part with clean hydraulic oil before assembly.

1. Install the spool to the sleeve.

Caution:

Install to cause lowering by its own weight, and never try forced striking.



Installing the Spool

LAW-10

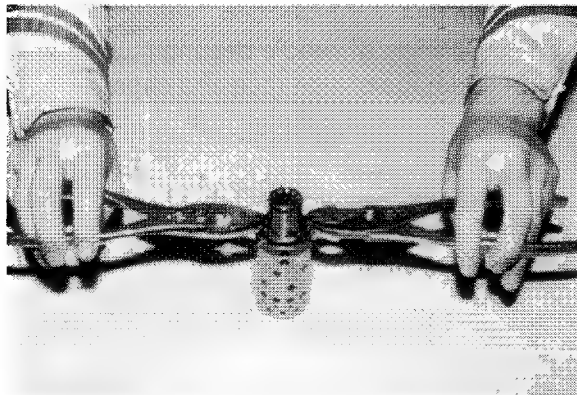
Install the centering spring to the spool

- (1) Centering spring

Caution:

Make the cutout side face the sleeve.

- (2) While pinching both ends of the centering spring with pliers, lower the spool and fit the spring to the groove on the sleeve.



Installing the Spring

LAP8-11

Straight pin installation



Installing the Straight Pin

LAP8-12

Drive shaft and rotor assembly

Caution:

- Assemble so that the drive shaft vertical groove match the line connecting the rotor teeth bottoms.
- Adjust the rotor top and bottom to the direction before disassembly.

Assemble the drive shaft and rotor with the side plate and stator, and insert them to the valve body.

Caution:

Align the matching marks.

6. End cap installation

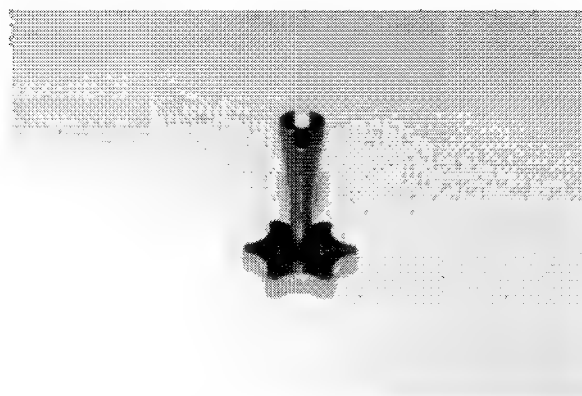
- (1) Spacer
- (2) End cap
- (3) Bolt

$T = 3.0 \sim 3.5 \text{ kg-m}$
(21.7 ~ 25.3 ft-lb)

Install the sleeve to the valve body.

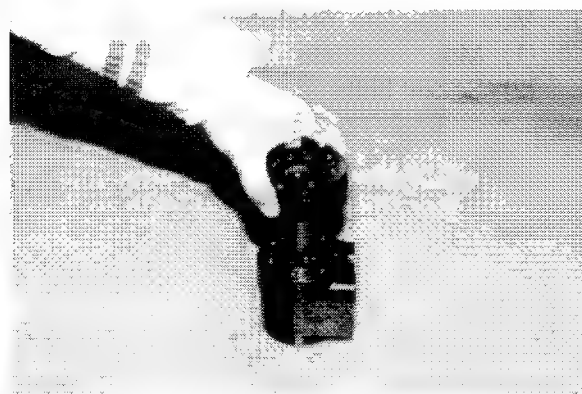
Caution:

Install so that the sleeve falls by its own weight, and never try forced striking.



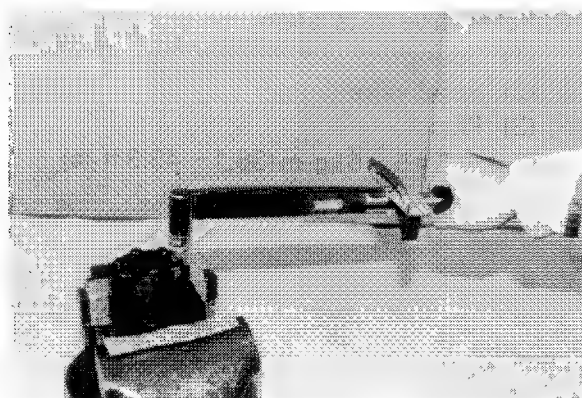
Installing the Drive Shaft

LAP8-21



Assembling the Drive Shaft and Rotor

BAH25-3



Installing the End Cap

LAP8-22



Installing the Sleeve

LAP8-23

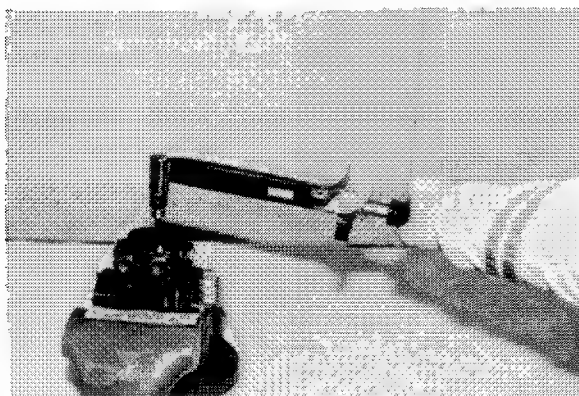
Needle bearing installation



Installing the Needle Bearing

LAP8-26,27

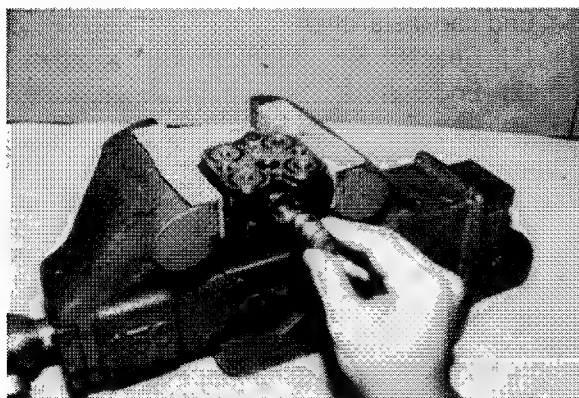
9. Mounting plate installation
- (1) Mounting plate
 - (2) Socket bolts
- $T = 2.0 \sim 2.5 \text{ kg-m}$
(14.5 ~ 18.1 ft-lb)



Installing the Mounting Plate

LAP8-32

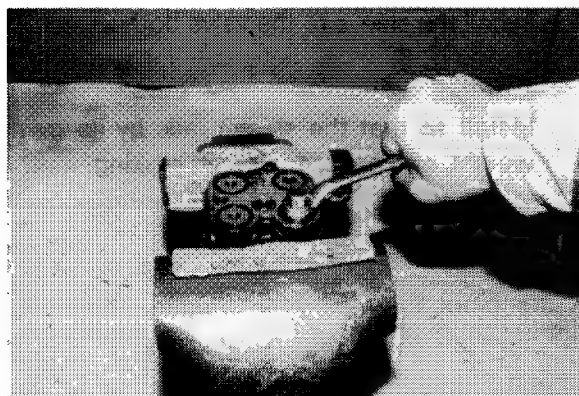
10. Relief valve installation
- (1) Spring
 - (2) Relief valve
 - (3) Plug
- $T = 5 \sim 6 \text{ kg-m}$ (36.1 ~ 43.3 ft-lb)



Installing the Relief Valve

LAP7-13

11. Check valve installation
- $T = 1.0 \sim 1.4 \text{ kg-m}$ (7.2 ~ 10.1 ft-lb)



Installing the Check Valve

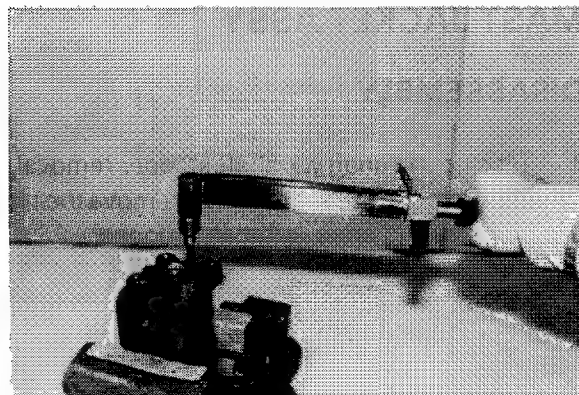
LAP7-9

12. Install the relief valve ASSY to the valve body.

(1) Relief valve ASSY

(2) Socket valve

T = 5 ~ 6 kg-cm (36.1 ~ 43.3 ft-lb)



Installing the Relief Valve ASSY

LAP8-33

ADJUSTMENT

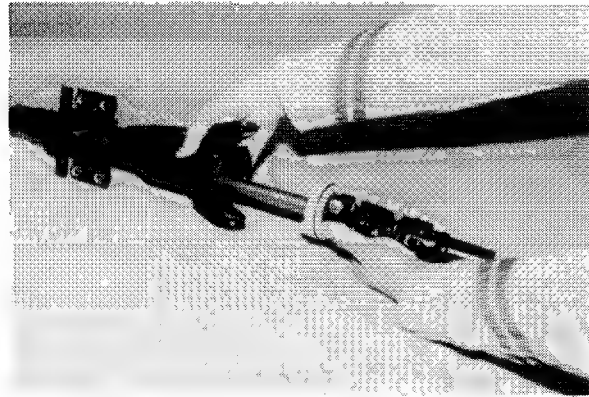
Measure the hydrostatic steering valve relief pressure. If it is defective, adjust by increasing or decreasing the relief valve shims.

Relief valve set pressure: 55 ~ 65 kg/cm² (782.0 ~ 924.3 psi)

MAST JACKET ASSY

DISASSEMBLY

1. Tilt steering shaft w/ shaft stopper removal.
 - (1) Remove the set bolt, and remove the tilt steering shaft w/ shaft stopper.

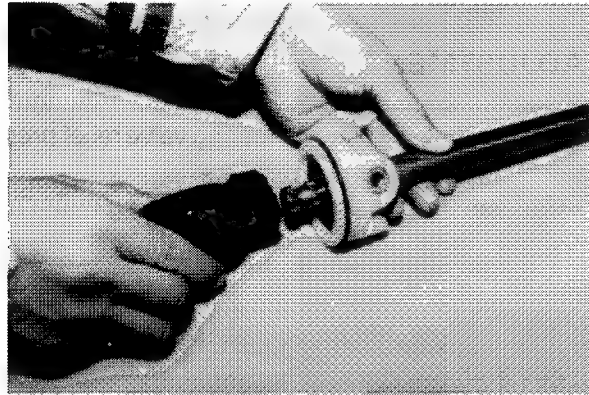


Removing the Steering Shaft

LAO123-6

Universal joint removal

- (1) Remove the set bolt, and remove the universal joint.



Removing the Universal Joint

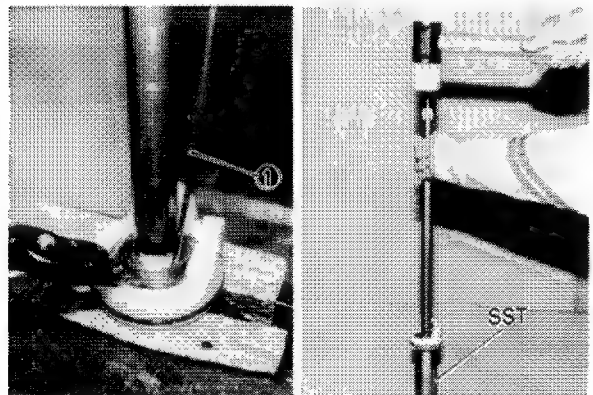
LAO123-9

Steering shaft stopper removal

- (1) Use snap ring pliers and a screwdriver to remove the snap ring.
- (2) Use the SST and a soft hammer to remove the shaft stopper from the steering shaft.

SST 09411-41800-71

- ① Screwdriver

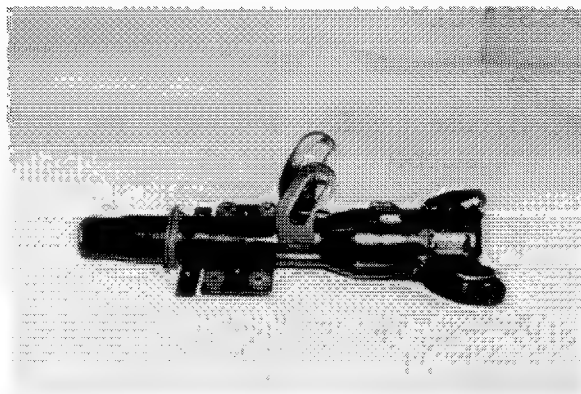


Removing the Shaft Stopper

LAO123-16.18

INSPECTION

1. Mast jacket SUB-ASSY inspection
 - (1) Deformation and damage on the mast jacket cylinder.
 - (2) Spring hook deformation, and cracks at welded portion.
 - (3) Degradation and damage of grommet

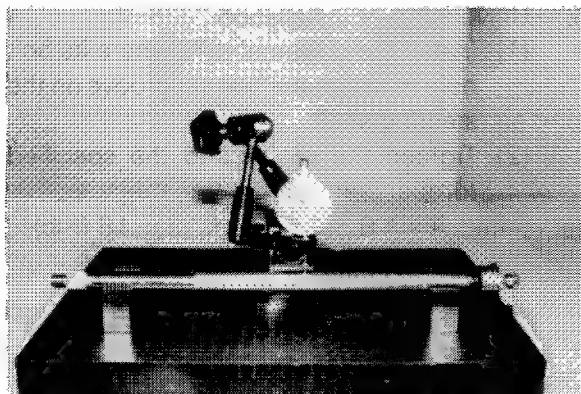


Inspecting the Mast Jacket SUB-ASSY

LAO123-27

Tilt shaft inspection

- (1) Shaft bending
Bending limit: 1.5 mm (0.059in)
- (2) Damage at serration and threaded portion.



Inspecting the Tilt Shaft

LAO123-20

Universal joint inspection

- (1) Looseness and sticking at spider portion
- (2) Damage at serration
- (3) Damage and rusting of spline portion

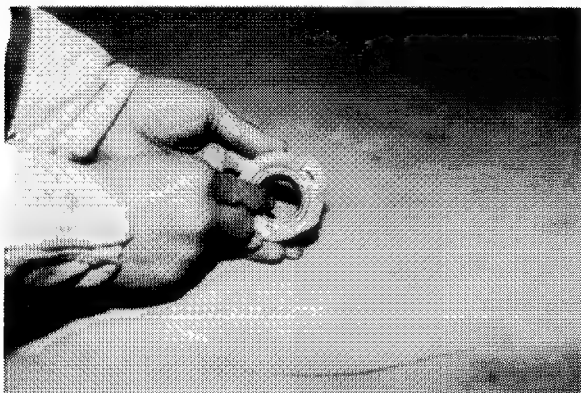


Inspecting the Universal Joint

LAO123-23

Shaft stopper inspection

- (1) Degradation and damage of plastic portion
- (2) Abnormal sound and rotating condition of bearing.

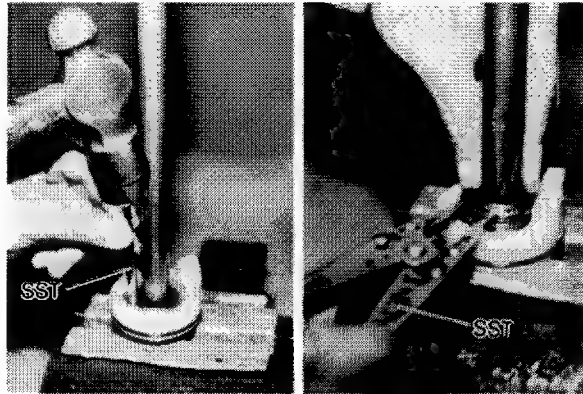


Inspecting the Shaft Stopper

LAO123-22

ASSEMBLY

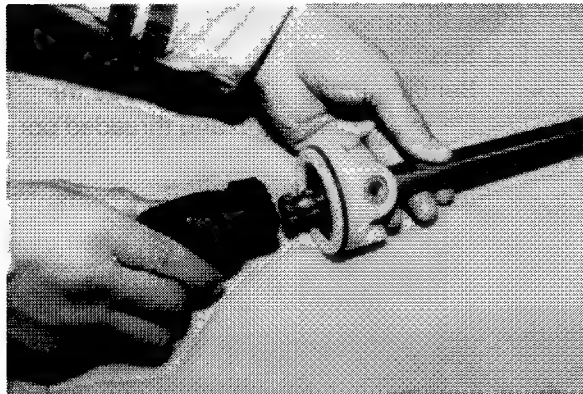
1. Shaft stopper installation
 - (1) Use the SST and install the shaft stopper to the tilt shaft.
SST 09700-30200-71
 - (2) Install the snap ring by using SST.
SST 09905-00012



Installing the Shaft Stopper

LA0123-28,31

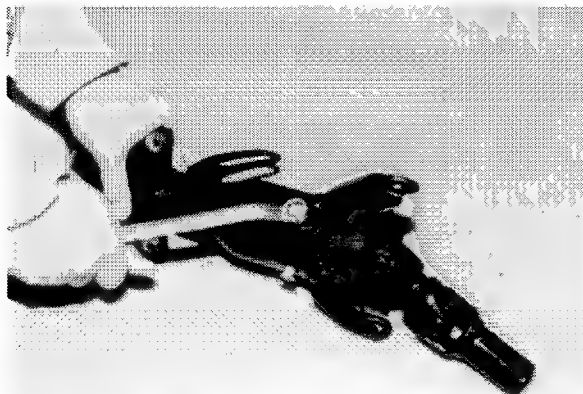
2. Universal joint installation
 - (1) Install the universal joint where its bolt hole matches the bolt set groove on the steering shaft.
 - (2) Tighten the set bolt to the specified torque.
 $T = 1.8 \sim 2.5 \text{ kg-m (13 \sim 18 ft-lb)}$



Installing the Universal Joint

LA0123-9

3. Steering shaft with universal joint installation
 - (1) Align the shaft stopper set bolt hole and the mast jacket set bolt hole at the time of installation.
 - (2) Firmly tighten the set bolt.



Installing the Universal Joint

LA0123-4

INSTALLATION

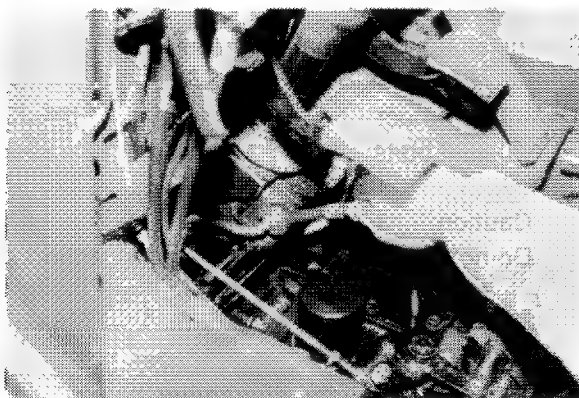
1. Installing the steering valve
 - (1) Steering valve
 - (2) Set nuts
 $T = 5 \sim 8 \text{ kg-m (36.1} \sim 57.6 \text{ ft-lb)}$



Installing the Steering Valve

LAR34-30

2. Hydraulic piping connection
 - (1) Outlet pipes
 - (2) Inlet pipes
3. Toe-board installation



Installing the Hydraulic Piping

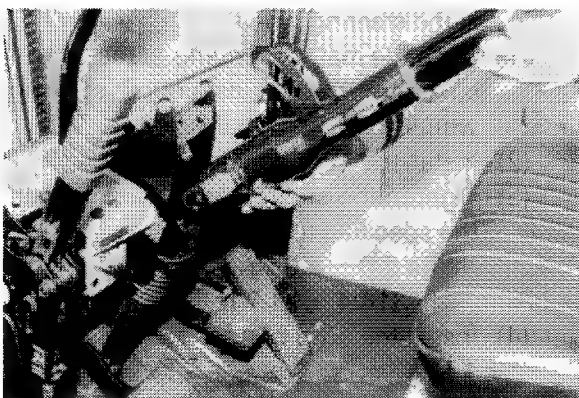
LAR34-24

Installing the mast jacket w/ tilt steering.

- (1) Mast jacket w/ tilt steering
- (2) Bush
- (3) Set bolts, set nuts

Caution:

Do not forget to use the nylon bush when installing the mast jacket set bolts.



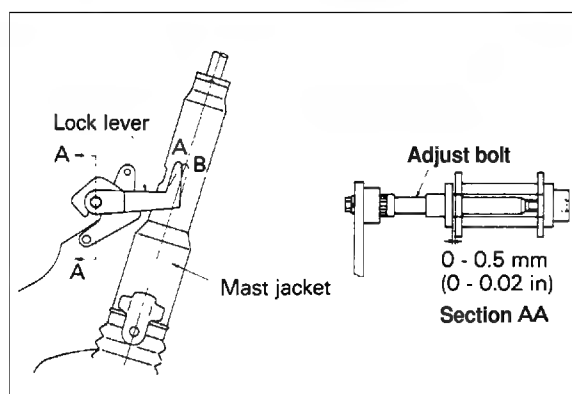
Installing the Mast Jacket

LAR34-20

5. Installing the tilt adjusting bolt and related part
 - (1) Install the tilt adjusting bolt.
 - (2) Coat MP grease on the lock portion.
 - (3) After installing the adjusting lever, move the lever and check if locking occurs at an arbitrary position.

Caution:

Set to position A-B when the lever is locked.



Installing the Adjusting Lever

LAOM208

6. Install the return spring
 - (1) Install the (large) spring and (small) spring in this order.

Caution:

Check that the lower side is securely hooked before the operation.

7. Install the Boot
8. Install the turn signal switch ASSY
 - (1) Turn signal switch ASSY
 - (2) Set bolts
9. Install the combination meter ASSY
 - (1) Combination meter ASSY
 - (2) Connect
 - (3) Set bolts

Caution:

Do not forget electrical wiring connection.

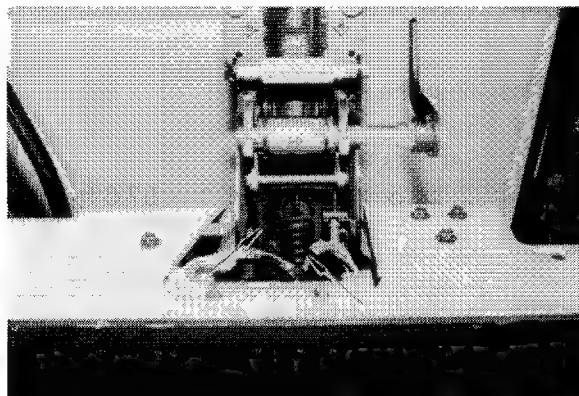
10. Install the steering wheel
 - (1) Align the matching marks at the time of disassembly and install the steering wheel.
 - (2) Install the horn contact parts.
 - (3) Tighten the steering wheel set nuts to the specified torque.

$T = 2.0 \sim 3.0 \text{ kg-m}$
(14.4 ~ 21.7 ft-lb)
 - (4) Install the horn button.

11. Relief pressure measurement
 - (1) Remove the oil pressure measuring plug and install the oil pressure gauge.
 - (2) Place a wooden block between the rear wheel and rear axle beam.
 - (3) Start the engine. Rotate the steering wheel and measure the relief pressure.

Standard relief pressure:

$55 \sim 65 \text{ kg/cm}^2$
(782.0 ~ 924.3 psi)



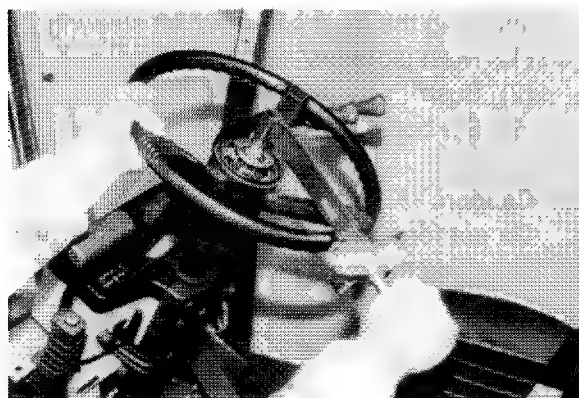
Installing the Spring

LAR34-13



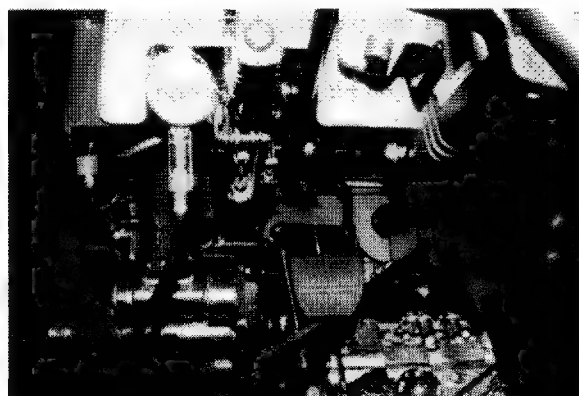
Installing the Combination Meter ASSY

LAR34-6



Installing the Steering Wheel

LAR34-31



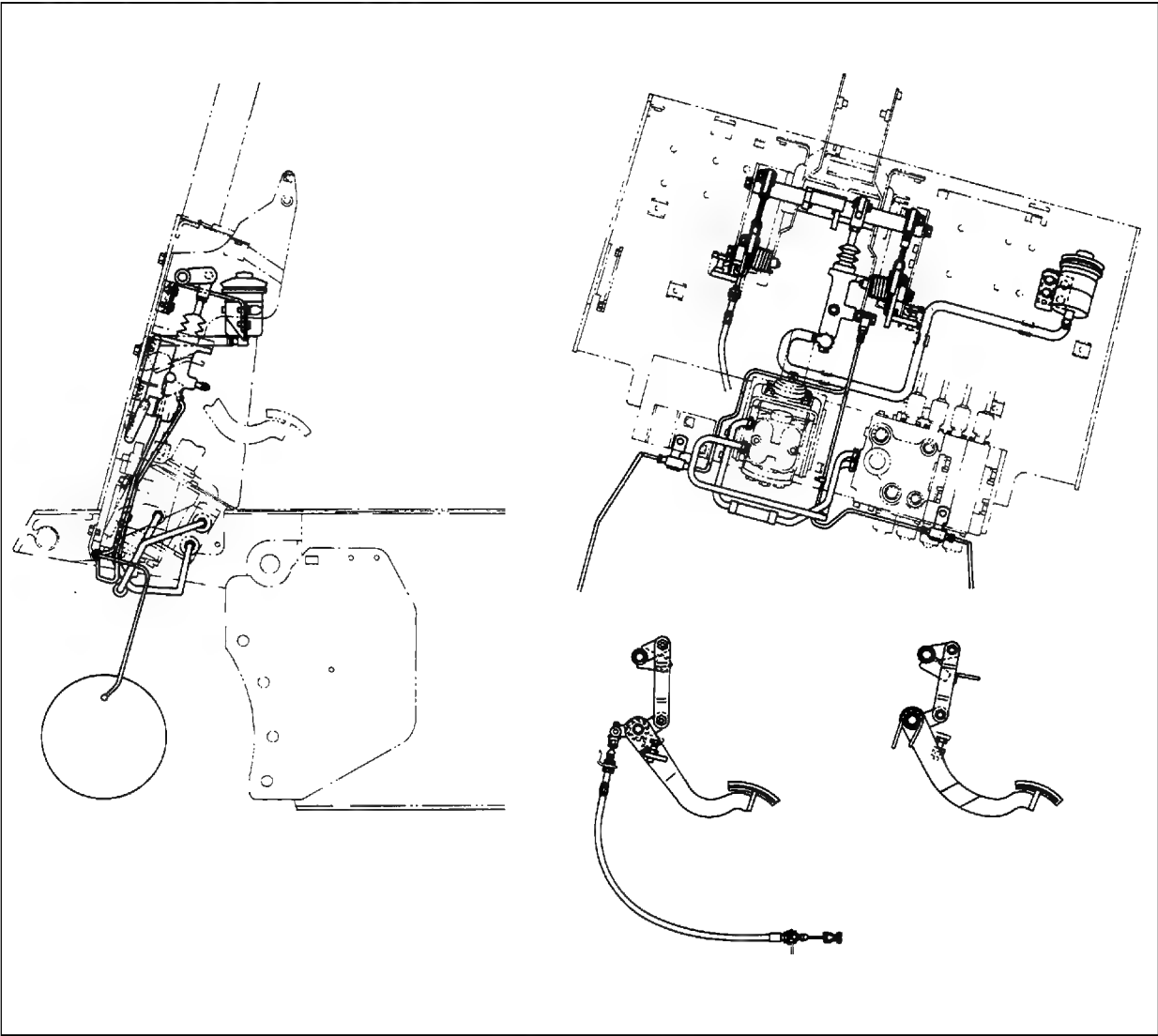
Measuring the Relief Pressure

LAP5-32

BRAKE

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FRONT BRAKE ASSEMBLY



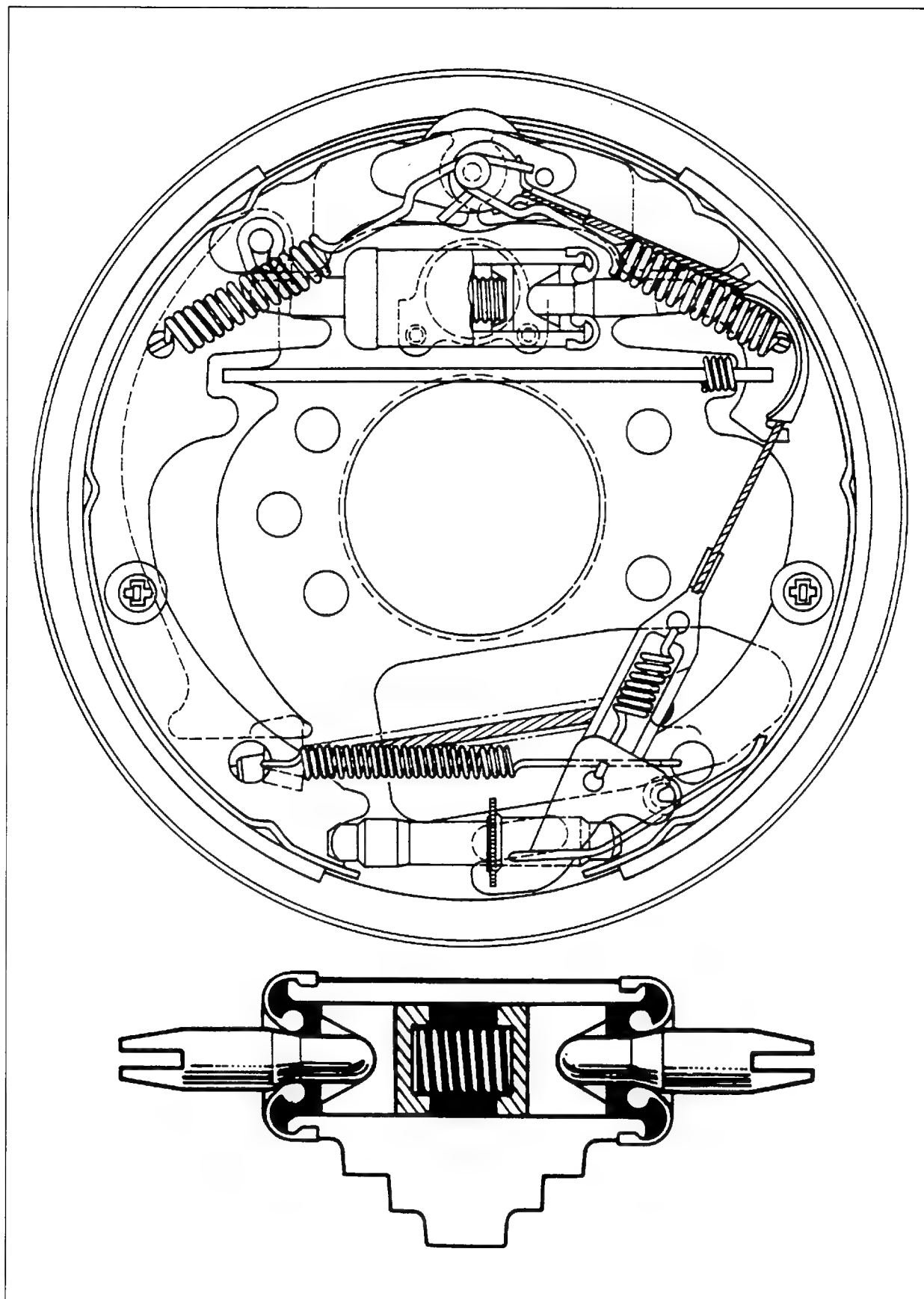
Brake System Diagram

LARL3

SPECIFICATIONS

Item			1.0 ~ 1.5 ton vehicle
Type	Foot brake		Hydraulic, interval expanding. duo-servo
	Parking brake		Mechanical, internal expanding
Brake drum inside diameter			254 mm (10 in)
Brake lining	Material		Molded resin
	Dimensions	Width	48.5 mm (1.91 in)
		Thickness	5.0 mm (0.2 in)
		Area	271 cm2 (42.0 in²)
Wheel cylinder bore			22.22 mm (0.875 in)
Master cylinder bore			19.05 mm (0.75 in)

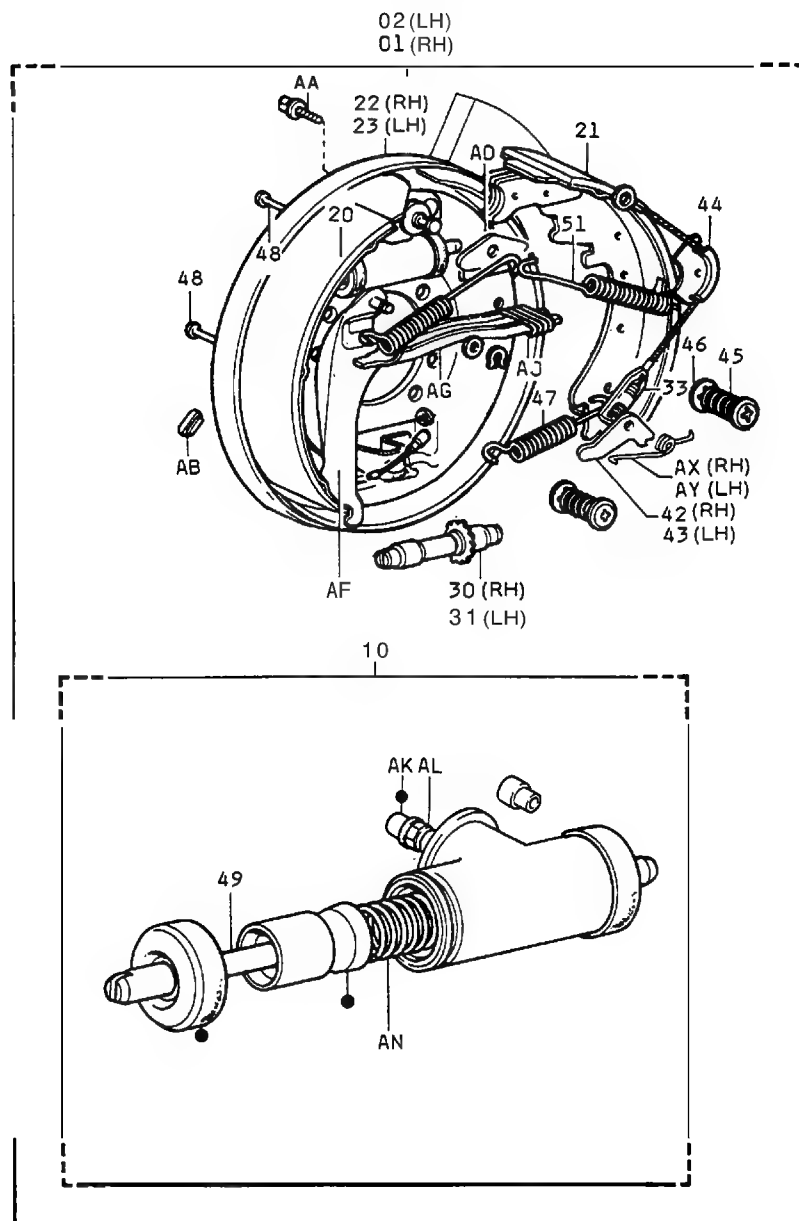
FRONT BRAKE SECTION



Foot Brake Section

LARM52

COMPONENTS



- | | |
|------------------------------------|-----------------------------|
| 01 Brake ASSY, RH | 48 Pin, shoe hold down |
| 02 Brake ASSY, LH | 49 Rod, push |
| 20 Shoe SUB-ASSY | 51 Spring, shoe return |
| 21 Shoe SUB-ASSY | AA Bolt & washer set |
| 22 Plate SUB-ASSY, backing, RH | AB Cover, hole |
| 23 Plate SUB-ASSY, backing, LH | AD Plate, shoe guide |
| 30 Screw SUB-ASSY, Adjusting, RH | AF Lever SUB-ASSY, parking |
| 31 Screw SUB-ASSY, Adjusting, LH | AG Strut, lever |
| 33 Cable & Fitting SUB-ASSY | AJ Strut, lever |
| 42 Lever, automatic adjustment, RH | AK Cap, bleeder screw |
| 43 Lever, automatic adjustment, LH | AL Screw, bleeder |
| 44 Guide, cable | AN Spring, wheel cylinder |
| 45 Spring, shoe hold down | AX Spring, lever return, RH |
| 46 Cup, shoe hold down | AY Spring, lever return, LH |
| 47 Spring, adjuster | |

Brake Components

LARM53

REMOVAL

Important:

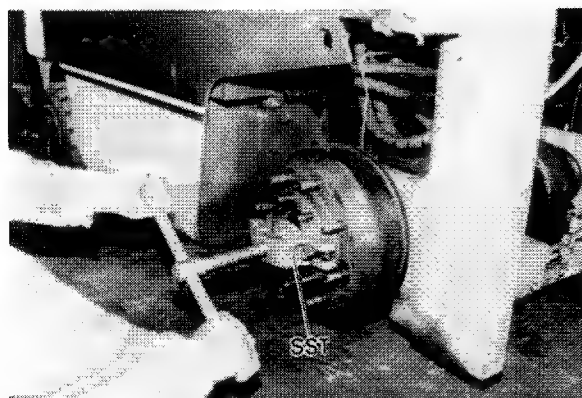
- Brake fluid is used vegetable oil.
- Do not get any brake fluid on vehicle painted surfaces.
- Be very careful not to get any mineral oil agents on various brake parts when performing either disassembly or replacement parts.
- For removal of the front axle hub, refer to the front axle section.
- The brake can be disassembled after removing the brake assy from the vehicle, or it can be disassembled part by part while on board the vehicle. The suitable menthed should be taken to confirm with the kind of trouble to be repaired.

Remove the front axle.

Reference:

Removing the front axle section.

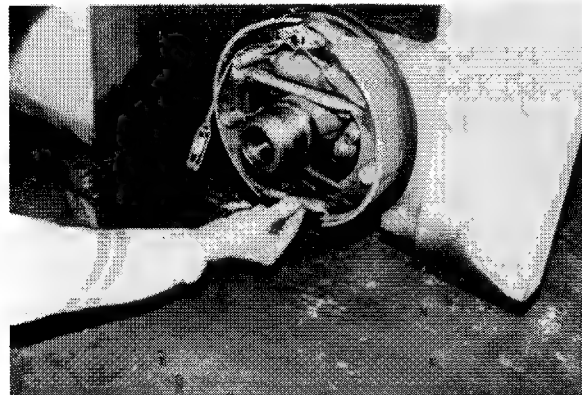
Drain out the brake fluid.



Removing Axle Hub

LAR17-26

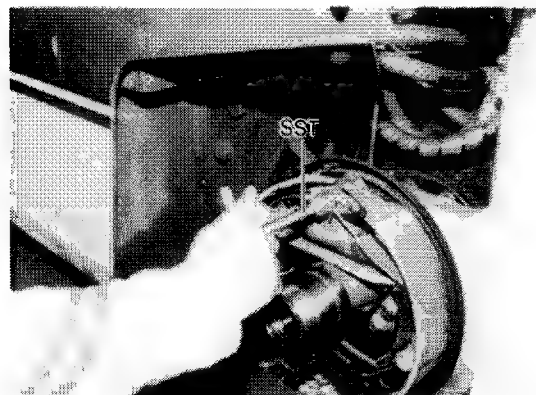
3. Remove the adjusting screw.
 - (1) Adjuster spring
 - (2) Automatic adjustment lever
 - (3) Adjusting screw



Removing Adjusting Screw

LAR17-33

4. Remove the shoe return springs
 - (1) Shoe return springs
SST09717-20010
 - (2) Cable & Fitting SUB-ASSY

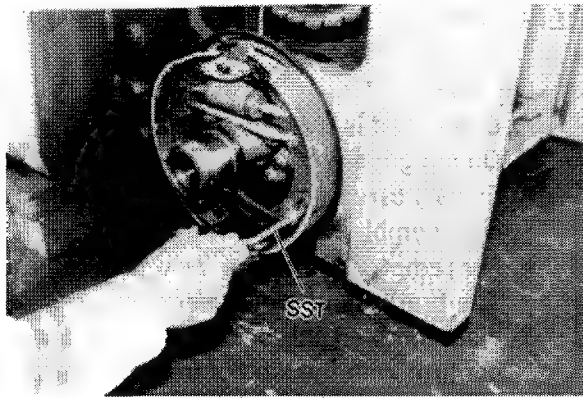


Removing Shoe Return Springs

LAR17-35

5. Remove the hold down springs.

- (1) Hold-down cups
SST 09510-31960-71 or
SST09510-10170-71
- (2) Hold-down springs
- (3) Hold-down cups

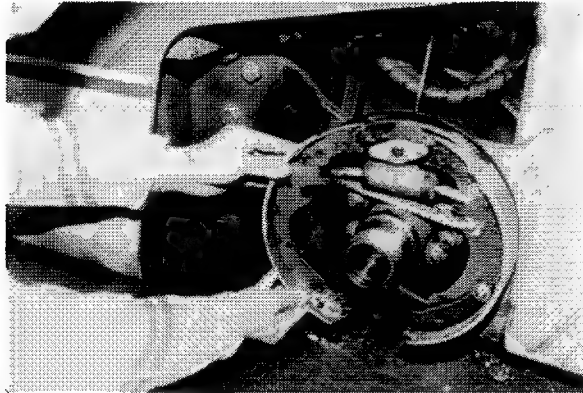


Removing Hold-down Spring

LAR18-1

6. Remove the brake shoes

- (1) Primary shoe
- (2) Secondary shoe
- (3) Parking brake cable
- (4) Strut bar, spring



Removing Brake Shoes

LAR18-3

7. Remove the parking lever.

- (1) "U" ring
- (2) Lever pin
- (3) Brake lever

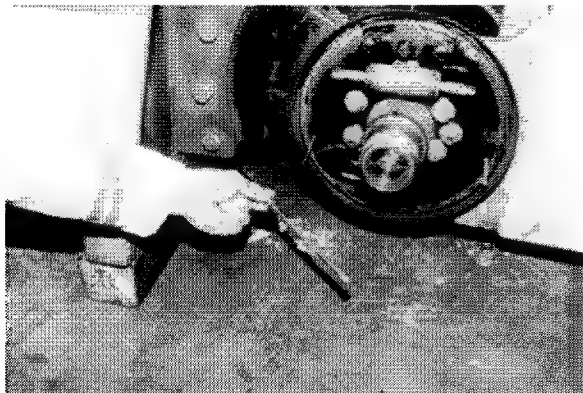


Removing Brake Lever

LAR18-34

8. Disconnect the parking brake cable.

- (1) Snap ring
- (2) Parking brake cable

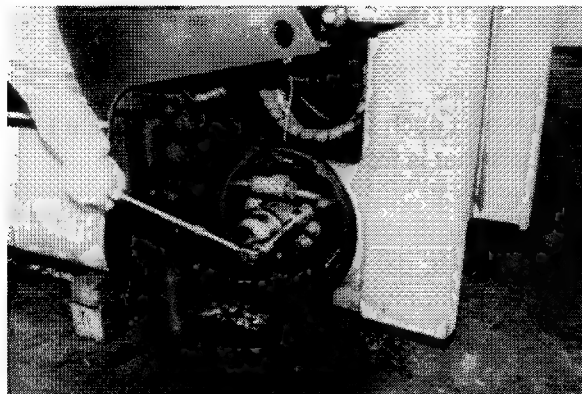


Disconnecting Parking Brake Cable

LAR18-8

Remove the backing plate.

- (1) Brake pipe
- (2) Backing plate set nuts
- (3) Backing plate

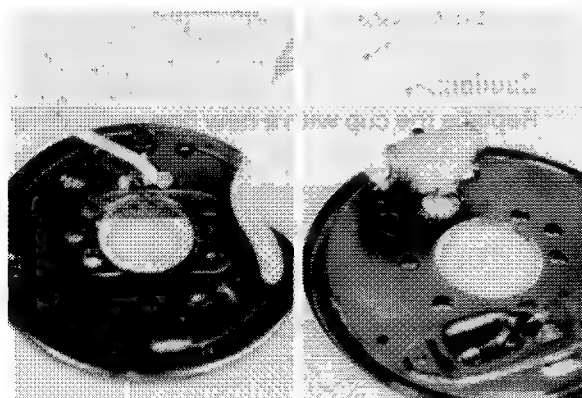


Removing Backing Plate

LAR18-13

10. Remove the wheel cylinder.

- (1) Set bolts
- (2) Wheel cylinder



Removing Wheel Cylinder

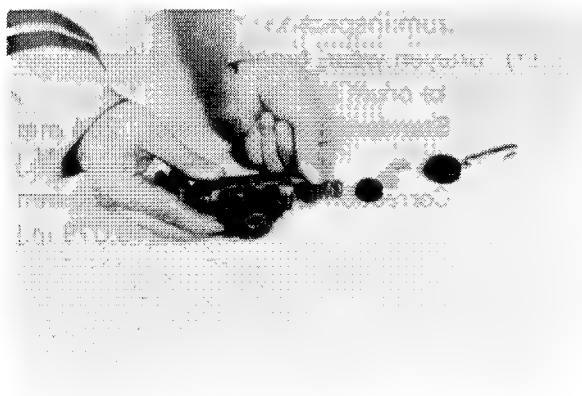
LAR18-20.22

11. Disassemble the wheel cylinder.

- (1) Connecting links
- (2) Wheel cylinder boots
- (3) Pistons
- (4) Wheel cylinder cups
- (5) Wheel cylinder spring

Caution:

- **Disassemble just before inspection. Replace any defective parts found and reassemble immediately.**
- **Never allow any mineral oil or grease to come in contact.**



Wheel Cylinder Disassembled

LAR18-28

INSPECTION

Caution:

Inspect each part, and repair or replace any part that is found defective.

1. Wheel cylinder inspection
 - (1) Rust, damage and wear of wheel cylinder bore and piston

Piston clearance:
 $0.040\text{—}0.125\text{ mm}$
 $(0.0016\text{—}0.0049\text{ in.})$
 - (2) Wear, damage and degradation of piston cup

Caution:

Replace the cup with a new one at the time of overhaul.

- (3) Damage and ageing of cylinder boot
- (4) Damage and deformation of connecting rod
- (5) Deformation and fatigue of spring

Brake drum inspection

- (1) Uneven wear, tapering and streaks on brake drum inside.

Standard inside diameter: 254 mm
 (10.00 in.)

Correction limit: 256 mm
 (10.079 in.)

3. Brake shoe inspection
 - (1) Wear, damage and oiling of brake shoe lining

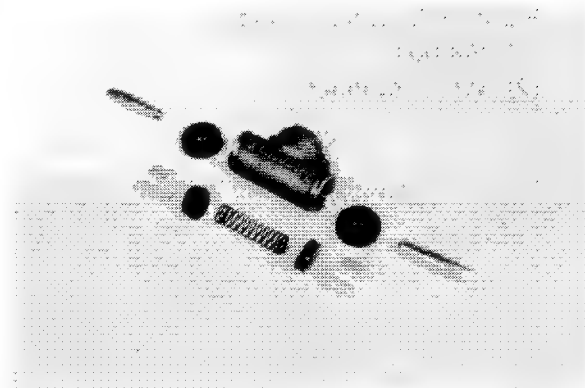
Standard thickness: 5.0 mm
 (0.197 in.)

Thickness limit: 1.0 mm
 (0.040 in.)



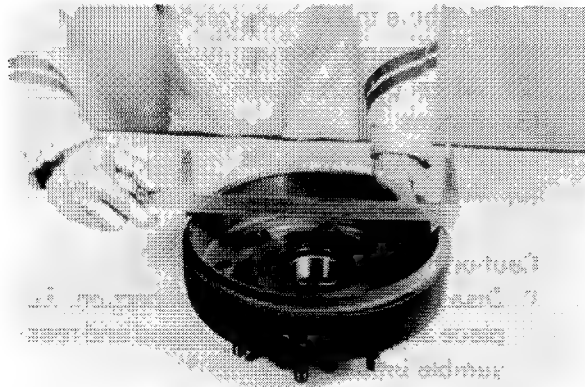
Wheel Cylinder Inspection(1)

LAR18-30



Wheel Cylinder Inspection(2)

LAR18-24



Brake Drum Inspection

LAR19-12

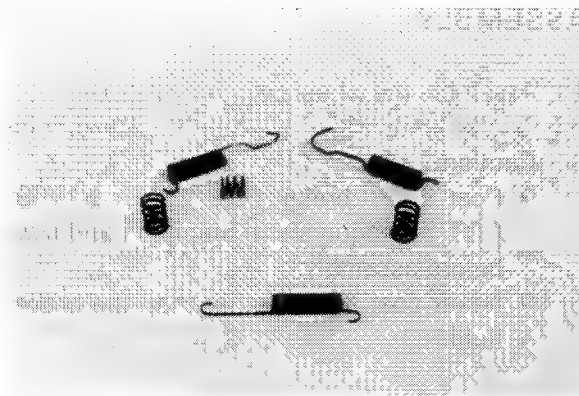


Brake Lining Inspection

LAR18-36

Spring inspection

- (1) Deformation of shoe return spring
Free length: 102 mm (4.02 in.)
- (2) Deformation of adjusting spring
Free length: 79 mm (3.11 in.)
- (3) Deformation of strut shoe spring
Free length: 18 mm (0.71 in.)
- (4) Deformation of hold-down spring
Free length: 25.7 mm (1.01 in.)

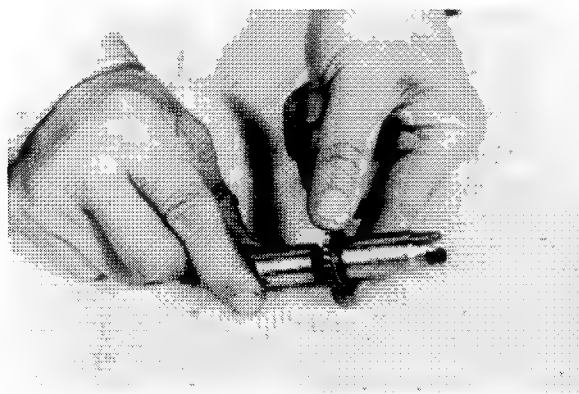


Spring Inspection

LAR19-2

5. Adjusting screw inspection

- (1) Wear, damage and deformation of teeth
- (2) Wear and rotating condition of threaded part



Adjusting Screw Inspection

LAR19-3

Shoe hold-down cup inspection

- (1) Deformation and cracks of cup

Strut lever inspection

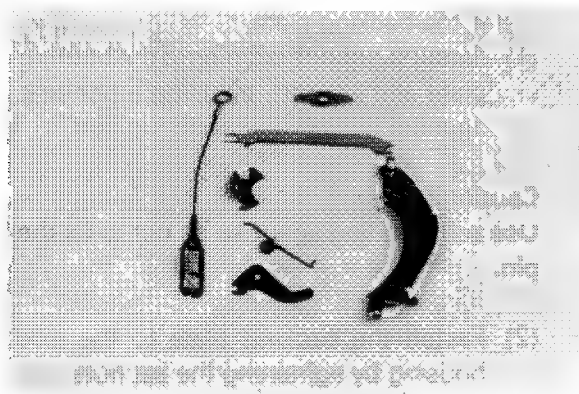
- (1) Bending, deformation and damage of lever

Automatic adjustment lever inspection

- (1) Deformation, cracks and wear of lever

Cable guide inspection

- (1) Deformation and damage of cable guide



Adjustment Lever Inspection

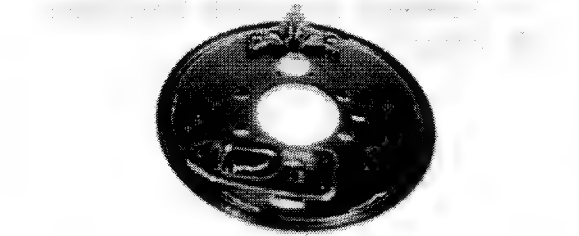
LAR19-9

10. Cable link inspection

- (1) Elongation and damage of cable

11. Backing plate inspection

- (1) Deformation, cracks and damage of backing plate



Backing Plate Inspection

LAR18-23

ASSEMBLY

1. Assemble the wheel cylinder.

Caution:

- Coat new brake fluid (SAE J-1703 DOT-3 or equivalent) on piston and cup before assembly.
- Never coat any oil other than the brake fluid.

- (1) Springs
- (2) Piston cups
- (3) Pistons
- (4) Cylinder boots
- (5) Connecting links

Install the wheel cylinder ASSY.

- (1) Install the wheel cylinder ASSY to the backing plate by using set bolts.

T = 0.8 ~ 1.2 kg-m
(5.776 ~ 8.664 ft-lb)

Install the backing plate.

- (1) Install the shoe hold pins to the backing plate and fit them by using a bonding agent.

Caution:

Use soft bonding agent so as not to fix the pin.

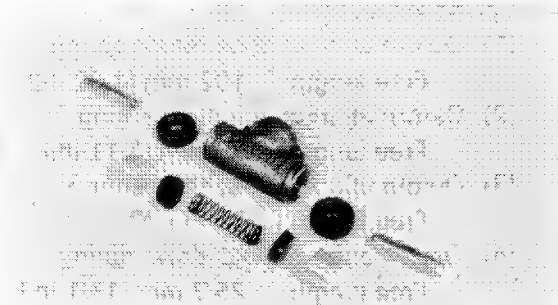
- (2) Fasten the backing plate to the axle housing by tightening the set nuts.

T = 5.0 ~ 8.0 kg-m
(36.1 ~ 57.86 ft-lb)

- (3) Brake pipe

Coat the heat resistance grease.

- (1) 7 places in contact with brake shoes
- (2) Anchor pin portion



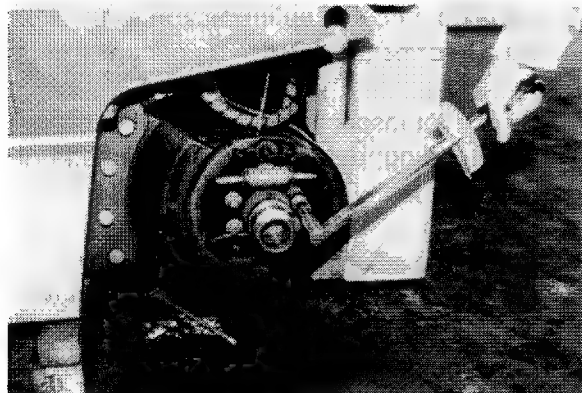
Assembling the Wheel Cylinder

LAR18-24



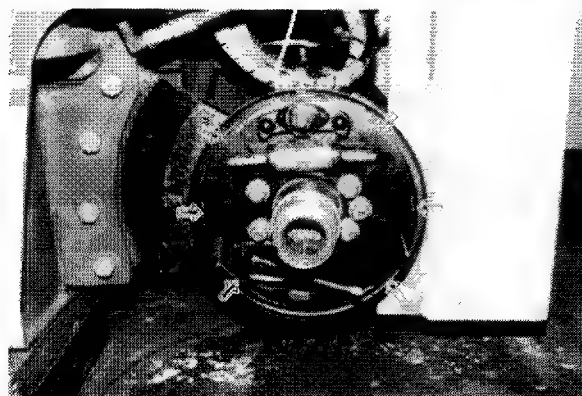
Installing the Wheel Cylinder ASSY

LAR18-27



Assembling the Backing Plate

LAR18-14



Coating the Grease

LAR19-16

5. Install the parking brake cable.

Caution:

After setting the U-ring, make sure that it is set securely.

6. Install the parking lever.

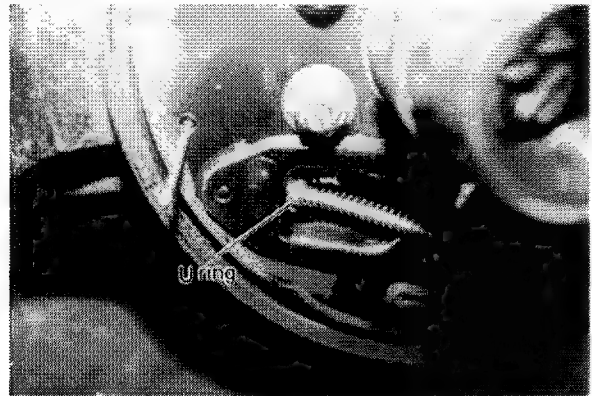
- (1) Install the parking lever to the brake shoe on the primary side.

Caution:

- Do not forget to use the wave washer.
- Set the U-ring securely.

Assemble the brake shoe.

- (1) Connect the end of the parking lever of the brake shoe on the primary side to the parking cable.



Installing the Cable

LAR18-6

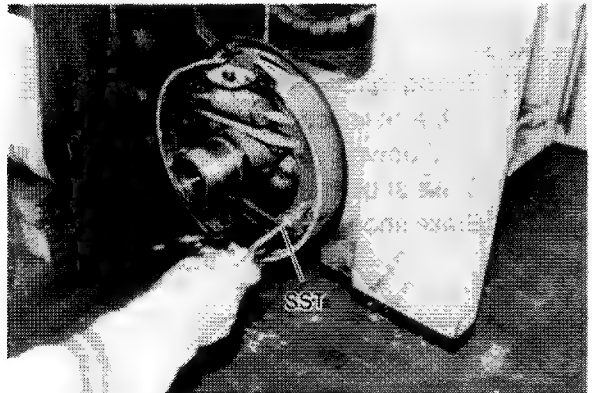


Brake Shoe Assembly (1)

LAR18-4

- (2) Install the primary and secondary brake shoes.

- ① Brake shoes
 - ② Strut bar and spring
 - ③ Hold down cup
 - ④ Spring
 - ⑤ Hold down cup
 - ⑥ Shoe guide plate
- SST 09510-31960-71 or
SST 09510-10170-71



Brake Shoe Assembly (2)

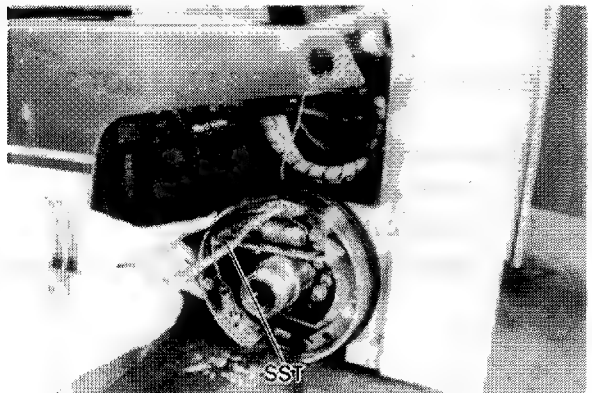
LAR18-2

Install the return spring.

- (1) Cable & fitting SUB-ASSY and cable guide
- (2) Shoe return springs
SST 09718-20010

Important:

Install the primary side first.



Installing the Return Springs

LAR19-20

9. Install the adjusting screw and lever.

Caution:

Coat grease thinly on the threaded part and fully tighten the screw.

- (1) Adjusting screw



Installing the Adjusting Screw

LAR17-33

- (2) Adjusting lever and lever return spring
- (3) Adjuster spring

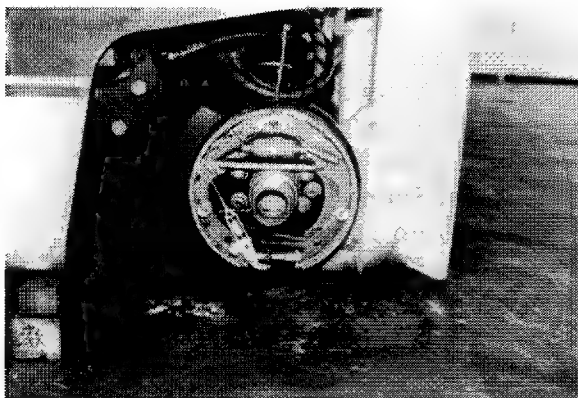


Installing the Springs

LAR17-30

10. Inspect the assembled state of the brake ASSY.

- (1) Spring installation status
- (2) Cable connection status
- (3) Hold down cup hole position
- (4) Brake shoe installation status
- (5) Brake shoe movement status



Inspecting the Assembly

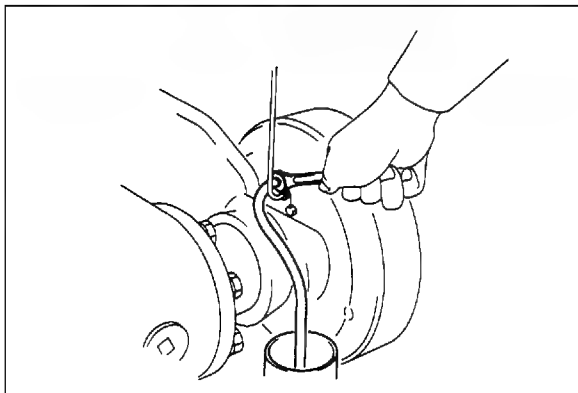
LAR17-28

11. Install the front axle hub.

12. Supply brake fluid (SAEJ-1703 DOT-3).

13. Bleed air from the brake system.

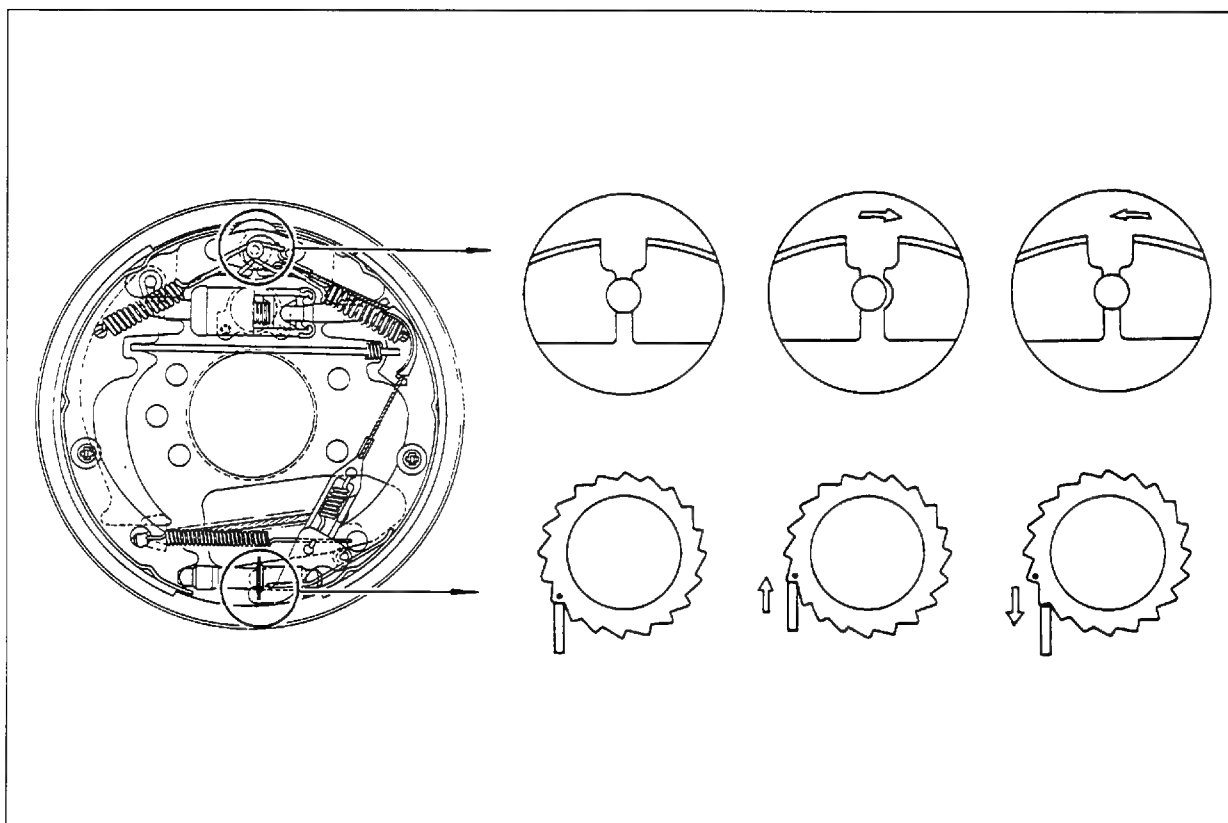
- (1) Wheel cylinder LH
- (2) Wheel cylinder RH
- (3) Master cylinder



Bleeding Air

LARS54

AUTO ADJUSTER OPERATIONAL TEST



Operating Sequence

LARM54

Operational Test

1. Adjust the brake shoe diameter until it is 1 mm (0.039 in.) smaller than the brake drum inside diameter, by turning the adjusting screw.

	1.0 ~ 1.5 ton vehicle
Brake drum inside diameter	254 mm (10 in.)

2. test the adjusting screw action.
 - (1) Push with finger the fitting cable toward the rear side shoe and then release.
 - 1) When the above movement is made, the adjusting lever should mesh into the next notch in the adjusting screw.
 - 2) When returned, the adjusting lever should release one notch and return to initial position.
3. In case of malfunction, check on the following points:
 - (1) The adjusting lever should contact on the adjusting screw tooth at right angles.
 - (2) The adjusting lever should contact on the adjusting screw at a point 5~7 mm (0.197~0.276 in.) above its center line.

Caution:

If the above position (1) or (2) is defective, the adjusting lever may operate but it will fail to mesh properly so that the adjusting screw will fail to adjust.

Braking Force Inspection and Adjustment

1. Braking force inspection

- (1) Inspect the braking force with a brake tester or by a traveling test.

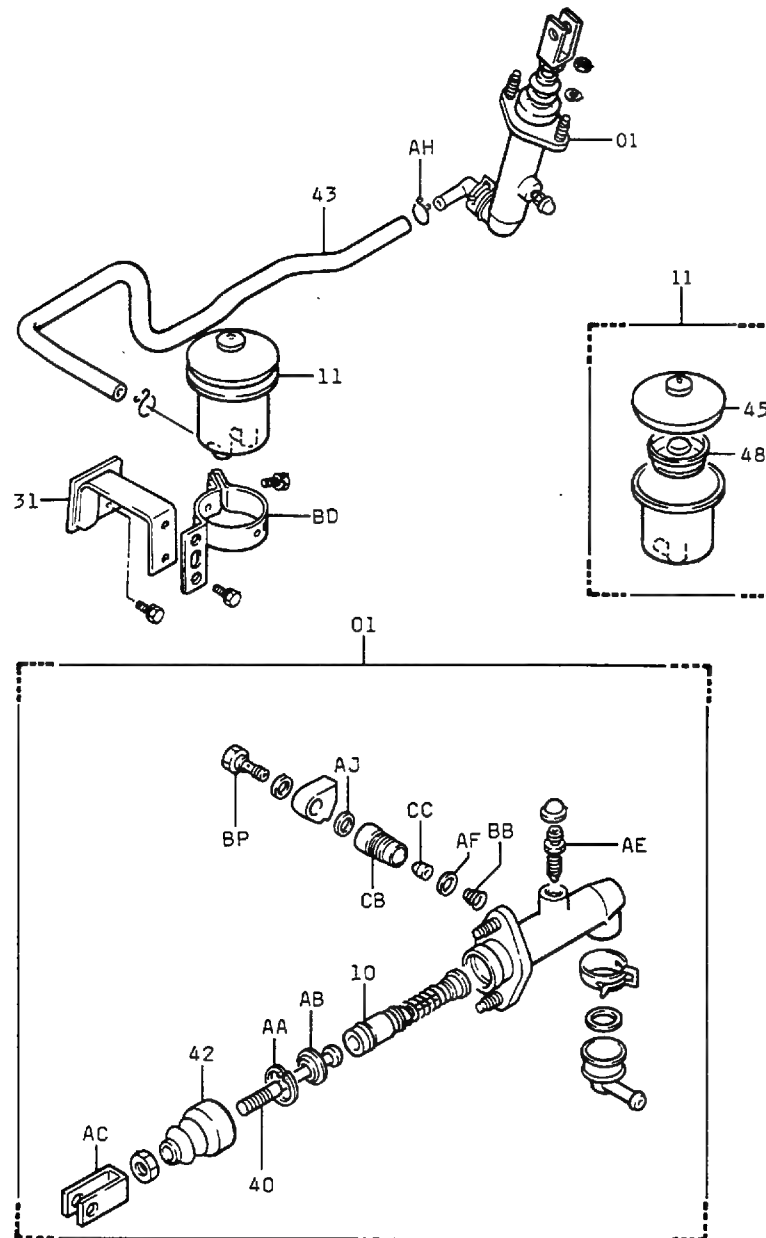
No load	Initial braking speed km/h (mph)	Braking distance m (in.)
1.0 ton series	17.5 (10.9)	5.0 or less (197)
1.25 ton series	17.5 (10.9)	↑
1.5 ton series	17.5 (10.9)	↑

2. Adjustment

- (1) If the pedal depressing margin above the floor is insufficient, make adjustment as follows:
Repeat forward and reverse travels and adjust the brake shoe clearance.
Adjustment by the adjusting screw is attained only when the brake pedal is depressed in the reverse traveling shift position.
- (2) When the braking force is insufficient, remove the brake drum and inspect the inside because it may be caused by adjuster malfunction, insufficient lining contact, foreign matter adhesion on lining, or brake fluid leak.
- (3) Defects similar to those in (2) are possible reasons for uneven braking performance or insufficient pedal depression margin.

BRAKE MASTER CYLINDER

COMPONENTS

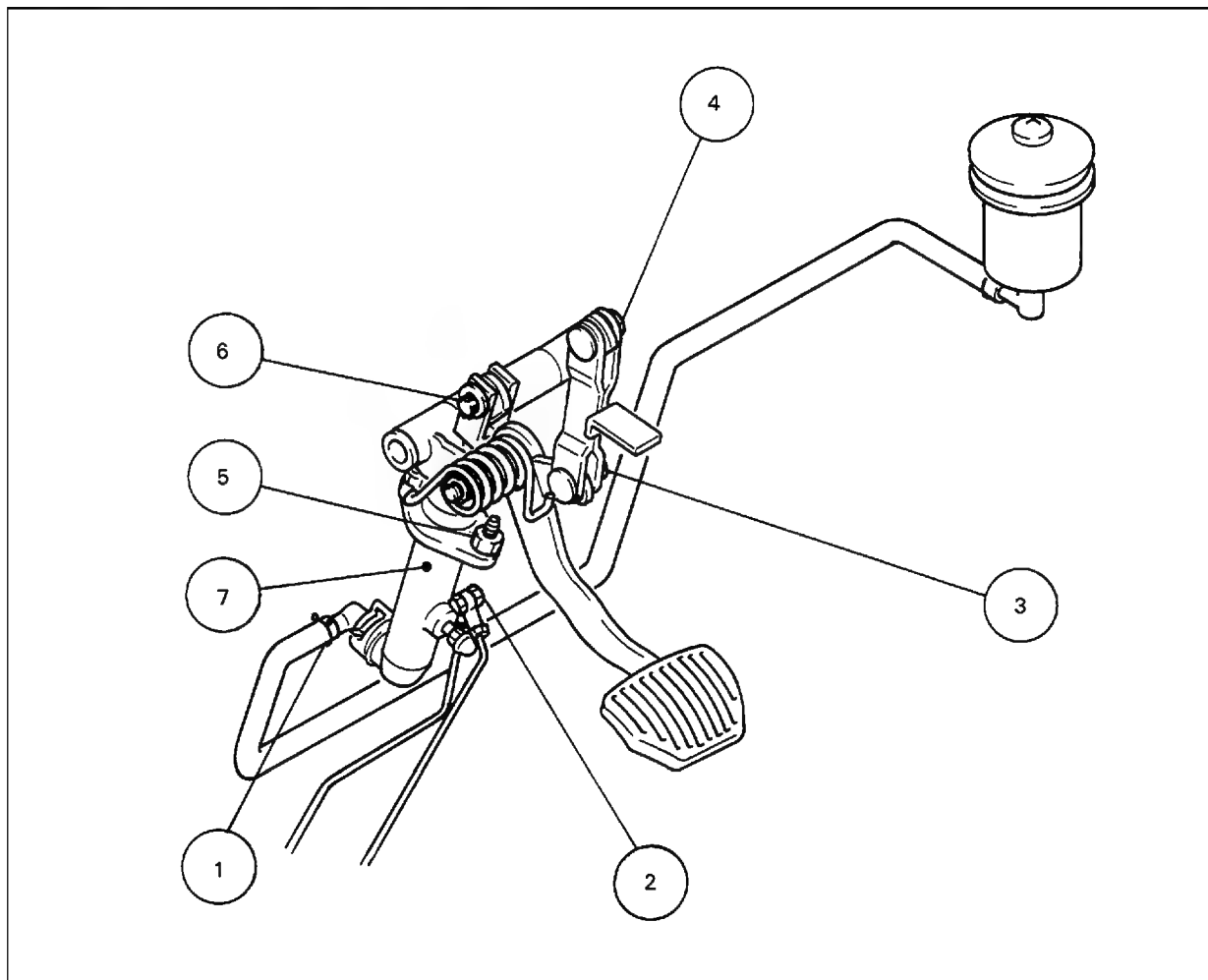


- | | | | |
|----|----------------------------------|----|---------------------|
| 01 | Cylinder ASSY, master | AC | Clevis, push rod |
| 10 | Piston SUB-ASSY, master cylinder | AE | Plug, bleeder |
| 11 | Reservoir set, master cylinder | AF | Gasket |
| 31 | Bracket SUB-ASSY, reservoir | AH | Clip |
| 40 | Rod, push | AJ | Gasket |
| 42 | Boot | BB | Spring, compression |
| 43 | Hose, reservoir | BD | Bracket SUB-ASSY |
| 45 | Cap, reservoir | BP | Bolt, union |
| 48 | Strainer | CB | Plug, fluid outlet |
| AA | Ring, hole snap | CC | Valve, outlet check |
| AB | Plate, piston stop | | |

REMOVAL

Preparation

1. Drain brake fluid from the reservoir tank.



Removing the Master Cylinder

LARM56

Removal Procedure

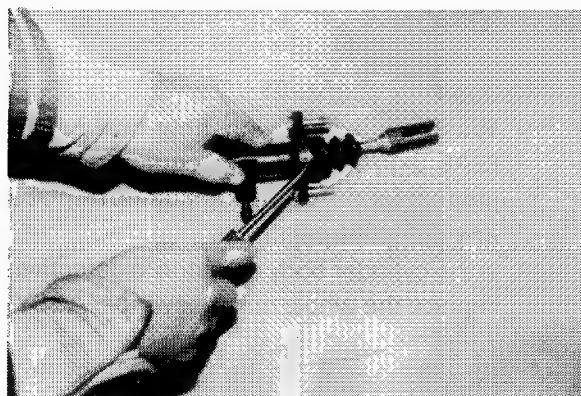
1. Reservoir hose disconnection
2. Brake pipe Union bolt
3. Brake link SUB-ASSY No. 1 disconnection
4. Brake link SUB-ASSY No. 2 set bolt
5. Master cylinder set bolt
6. Master cylinder push rod clevis pin
7. Master cylinder ASSY

DISASSEMBLY

Caution:

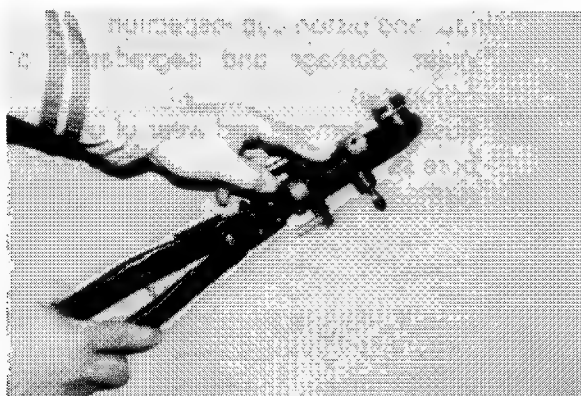
Never allow any mineral oil or grease other than the brake fluid (SAEJ-1703 DOT-3 or equivalent) stain any part.

1. Master cylinder boot removal
 - (1) Use a screwdriver and remove the master cylinder boot from the cylinder carefully to prevent any damage.
2. Push rod removal
 - (1) Use snap ring pliers and remove the snaps ring, push rod and boot.



Removing the Boot

LA047-22

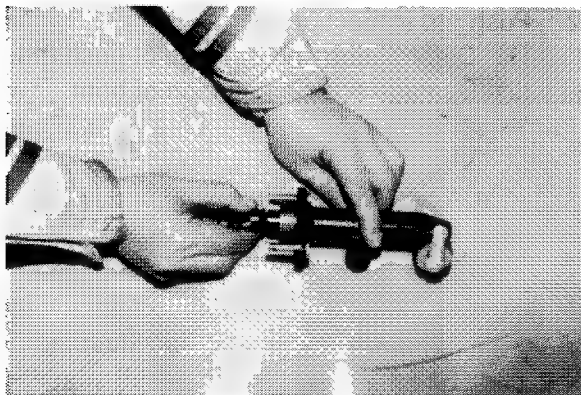


Removing the Push Rod

LA047-35

Piston removal

- (1) Take out the piston and spring ASSY from the cylinder.



Removing the Piston

LA047-34

4. Fluid inlet elbow removal
 - (1) Use pliers to loosen the clamp and remove the inlet elbow and gasket.



Removing the Inlet Elbow

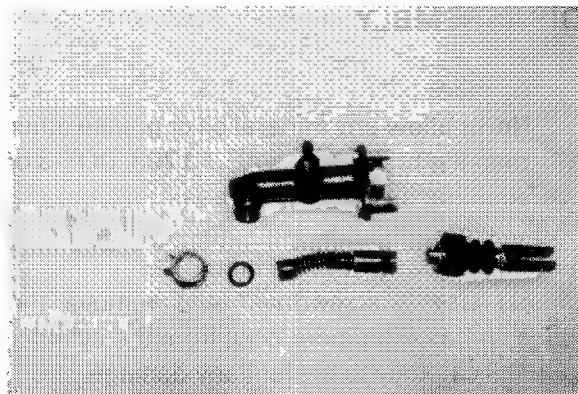
LA047-33

INSPECTION

Caution:

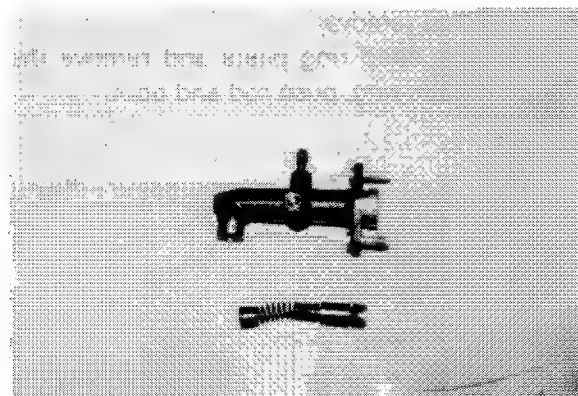
- Wash each part with new brake fluid (SAE J-1703 DOT-3 or equivalent) and inspect for the following points. Replace any defective part.
- If the cylinder body or piston is defective, replace the whole master cylinder ASSY.

1. Cylinder and piston cup inspection
 - (1) Wear, damage and degradation of piston cup
 - (2) Rusting, damage and wear of cylinder bore surface
 - (3) Damage and deformation of spring



Master Cylinder Inspection

LA—7-28

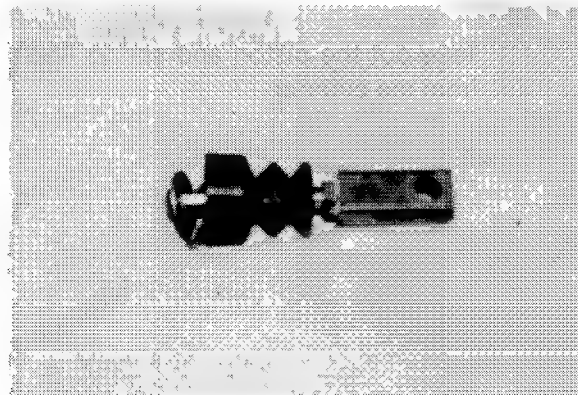


Piston Cylinder Inspection

LA—7-29

Push rod inspection

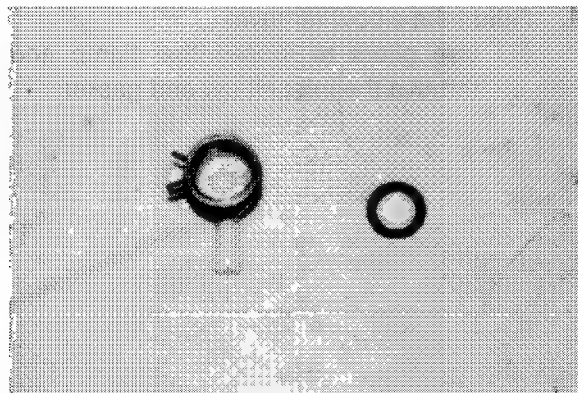
- (1) Deformation and damage of push rod
- (2) Damage and degradation of boot



Boot Inspection

LA047-31

3. Inlet elbow inspection
 - (1) Damage and deformation of inlet elbow
 - (2) Damage, deformation and degradation of gasket
 - (3) Deformation of clamp



Elbow Inspection

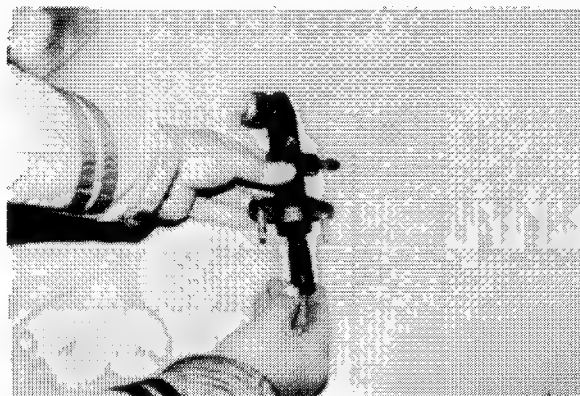
LA047-32

ASSEMBLY

The assembly procedure is the reverse of the disassembly procedure.

Caution:

- Wash each part and coat new fluid on each part before assembly.
- Coat rubber grease on piston cups before assembly.



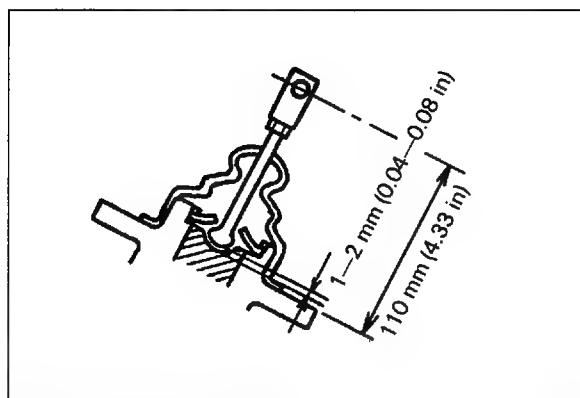
Assembling the Piston

LA047-27

INSTALLATION AND ADJUSTMENT

The installation procedure is the reverse of the removal procedure.

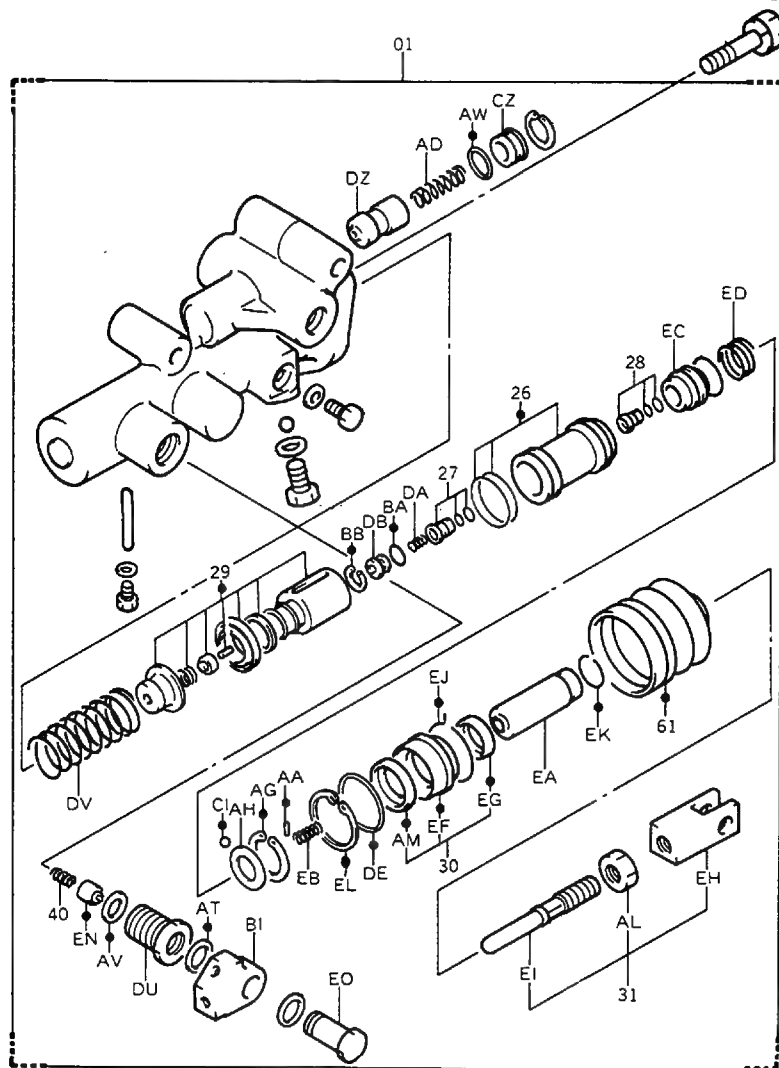
1. Set the master cylinder push rod and clevis.
Dimension: 110 mm (4.33 in)
 (Dimension from master cylinder mounting surface to the center of clevis pin)
2. Adjust the brake pedal height by referring to the pedal height adjustment section.
3. Carry out air bleeding.



Adjusting the Brake Pedal

LA0S413

BRAKE BOOSTER COMPONENTS (OPT)



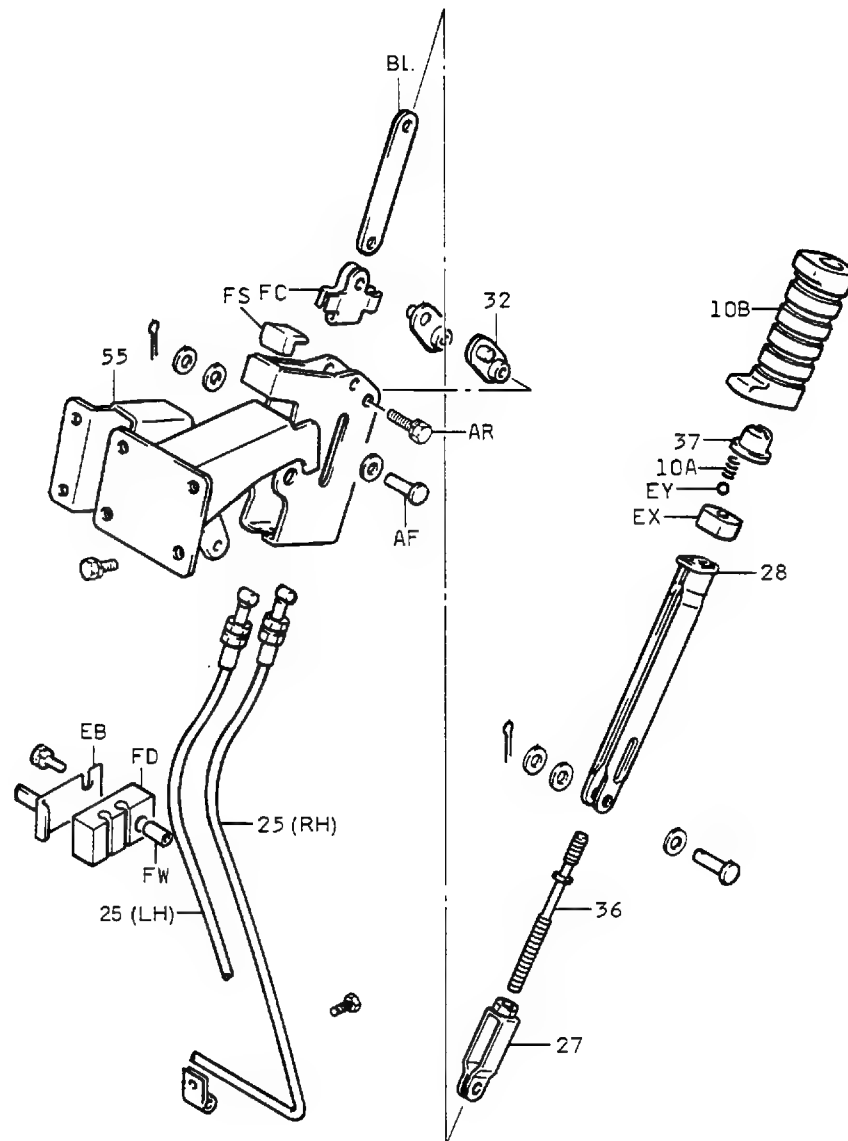
- | | | | |
|----|----------------------------------|----|------------------------|
| 01 | Booster ASSY, brake | BI | Union |
| 26 | Piston SUB-ASSY, power | CI | Ball, steel |
| 27 | Valve SUB-ASSY, control | CZ | Plug |
| 28 | Seat SUB-ASSY, control valve | DA | Spring |
| 29 | Piston SUB-ASSY, master cylinder | DB | Plug |
| 30 | Guide SUB-ASSY, reaction piston | DE | Ring, O |
| 31 | Rod SUB-ASSY, push | DU | Plug |
| 40 | Spring, compression | DV | Spring |
| 61 | Boot | DZ | Spool, flow divider |
| AA | Pin | EA | Piston, reaction |
| AD | Spring | EB | Spring, relief valve |
| AG | Ring, snap | EC | Piston, reaction |
| AH | Washer | ED | Spring, valve return |
| AL | Nut | EF | Guide, reaction piston |
| AM | Cup, cylinder | EG | Cup, cylinder |
| AT | Gasket | EH | Clevis, push rod |
| AV | Gasket | EI | Rod, push |
| AW | Ring, O | EK | Ring, snap |
| BA | Ring, O | EL | Ring, snap |
| BB | Ring, snap | EN | Valve, outlet check |
| | | EO | Bolt, union |

Brake Booster Components (OPT)

LARM57

PARKING BRAKE

COMPONENTS



10A Spring, compression
 10B Knob SUB-ASSY, parking brake
 25 Cable SUB-ASSY, No. 2
 27 Clevis SUB-ASSY
 28 Lever SUB-ASSY, parking brake
 32 Link SUB-ASSY, No. 1
 36 Rod SUB-ASSY, hand brake
 37 Knob SUB-ASSY
 55 Bracket SUB-ASSY, handbrake
 AF Pin, w/hole

AR Bolt
 BL Plate, parking brake
 EB Clamp, brake cable
 EX Knob
 EY Ball
 FC Hook
 FD Rubber, parking brake
 FS Stopper
 FW Pipe

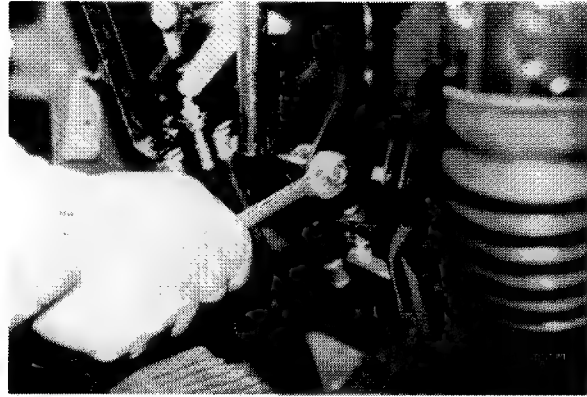
Parking Brake Components

LARM56

REMOVAL

Remove the toe board.

2. Remove the torque converter shift lever.
 - (1) Torque converter shift rod disconnect.
 - (2) Shift lever

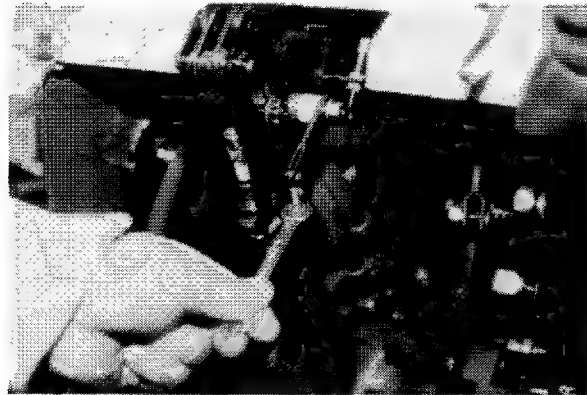


Removing the Shift Lever

LA047-16

Remove the engine hood and tilt handle wire.

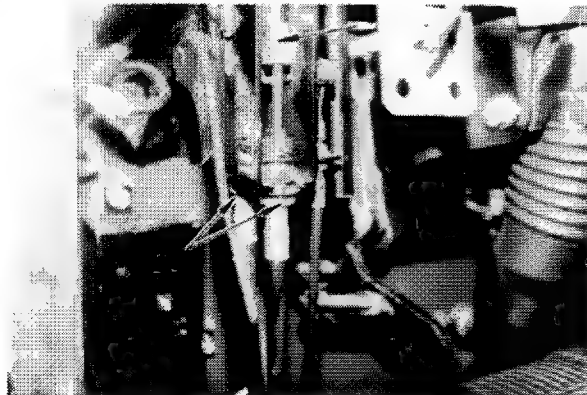
- (1) Engine hood wire
- (2) Tilt handle wire



Disconnecting the wire

LA044-16

4. Disconnect the parking brake wire.
 - (1) Loosen the lock nuts
 - (2) Disconnect the two wire from hook.



Disconnecting the wire

LAR22-15

5. Remove the parking brake lever ASSY.
 - (1) Set bolts
 - (2) Parking brake lever ASSY



Removing the Lever ASSY

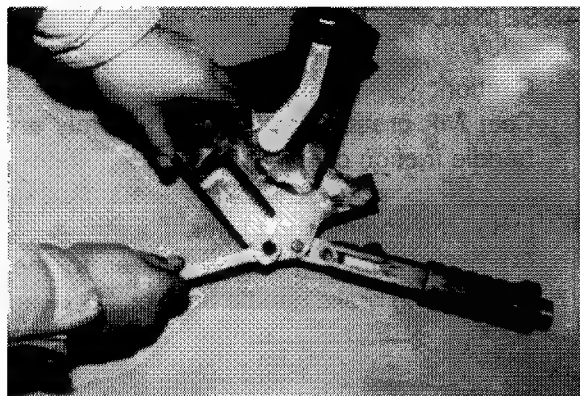
LA044-20

Separate the brake lever from bracket.

- (1) Set nut
- (2) Link SUB-ASSY
- (3) Brake lever

Caution:

Disassemble only when looseness by wear is observed as a result of lever movement check.



Separating the Brake Lever

LA081-22

INSPECTION

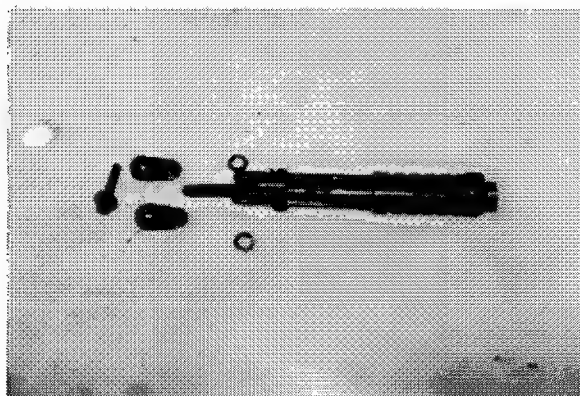
Caution:

Inspect each part, and repair or replace any defective part.

1. Parking brake lever SUB-ASSY inspection.
 - (1) Parking brake lever bending and wear of groove.
 - (2) Deformation of parking brake link
 - (3) Bending and deformation of parking brake rod
 - (4) Damage and deformation of parking brake knob

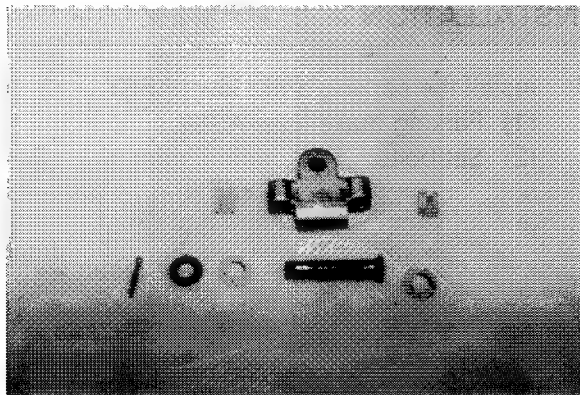
Hook and pin inspection

- (1) Wear, deformation and damage of hook portion in contact with wire
- (2) Deformation and damage of pin



Lever SUB-ASSY Inspection

LA047-2



Hook and Pin Inspection

LA044-22

3. Parking brake bracket inspection
 - (1) Damage and deformation of bracket
 - (2) Wear and damage of groove.



Bracket Inspection

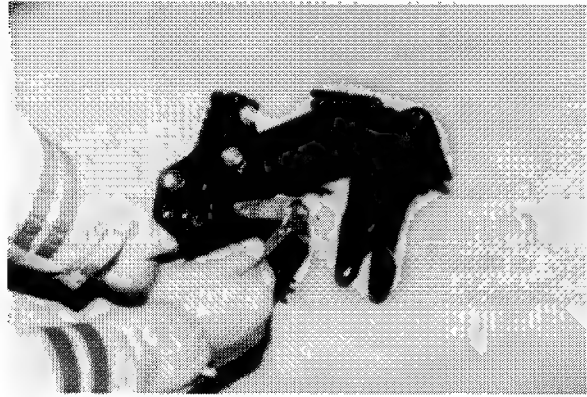
LA047-4

ASSEMBLY

Caution:

Coat MP grease lightly and uniformly on handle friction contact surface.

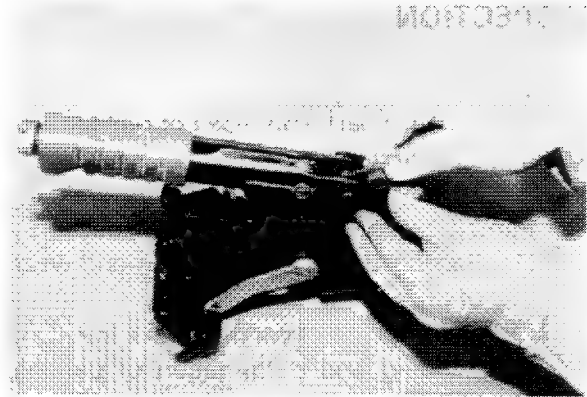
1. Install the engine hood lever.
 - (1) Install the engine hood lever to the parking brake handle bracket.



Installing the Hood Lever

LAO47-6

2. Install the parking brake lever.
 - (1) Parking brake lever
 - (2) Brake link
 - (3) Set bolt



Installing the Brake Lever

LAO47-8

INSTALLATION

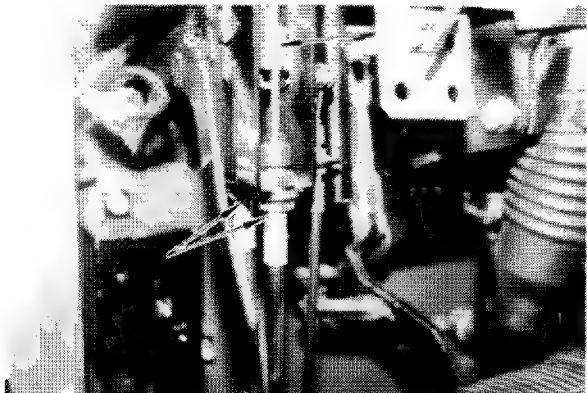
1. Install the parking brake lever ASSY.
 - (1) Parking brake lever ASSY
 - (2) Set bolts



Installing the Brake Lever ASSY

LAO44-20

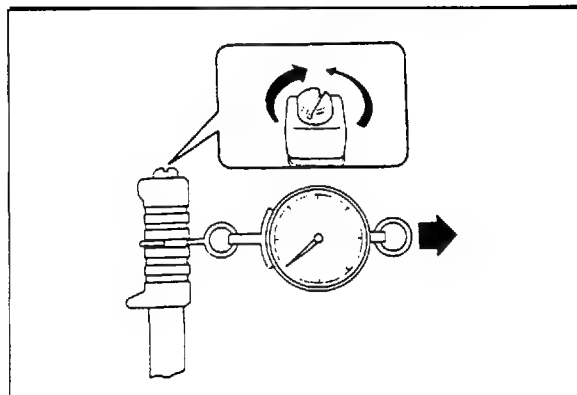
2. Install the parking brake cable.
 - (1) Front cable
 - (2) Rear cable
 - (3) Loosen the lock nuts.



Connecting the wire

LAR22-15

3. Parking brake lever operating force adjustment
- (1) Install a spring scale at the center of the parking brake grip. Pull the lever backward and measure the operating force.
- Operating force: 15 ~ 20 kg
(33.08 ~ 44.1 lb)**
- (2) If the operating force is not within the above range, turn the adjusting screw at the top of the brake lever for adjustment. Keep the brake released during the adjustment.



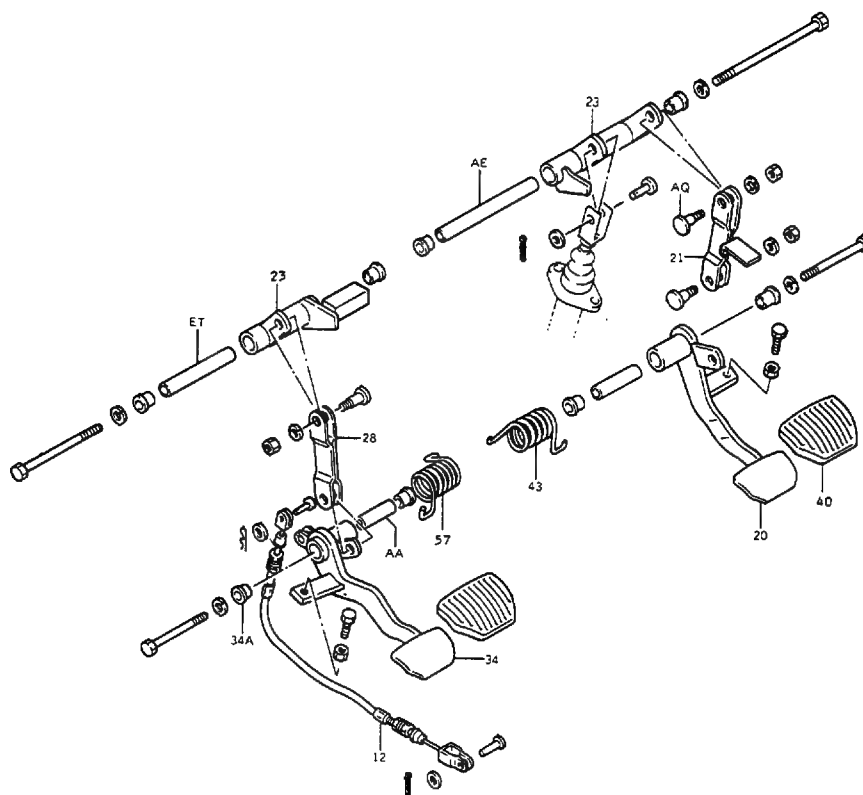
Lever Operating Force

LARS63

Clockwise turn ...
Increases the operating force.
Counterclockwise turn ...
Decrease the operating force.

BRAKE PEDAL

COMPONENTS



12 Wire ASSY, inching
 20 Pedal SUB-ASSY, brake
 21 Link SUB-ASSY, brake, No. 1
 23 Link SUB-ASSY, brake, No. 2
 28 Link SUB-ASSY, inching
 34 Pedal SUB-ASSY, inching brake
 34A Bushing

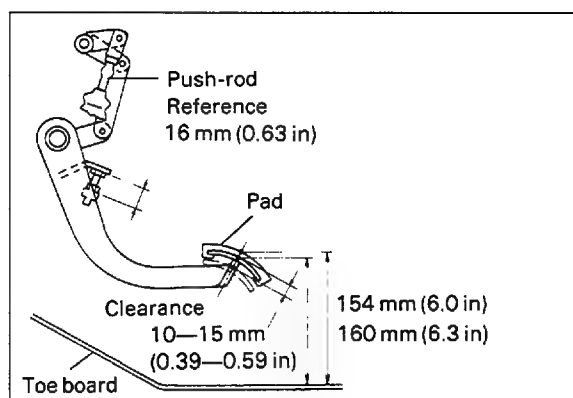
40 Pad, pedal
 43 Spring, torsion
 57 Spring, torsion
 AA Spacer
 AE Spacer
 AQ Bolt
 ET Spacer

Brake Pedal Components

LARM59

ADJUSTMENT

1. Brake pedal height and play
 - (1) Adjust the pedal stopper bolt to make the brake pedal height above the top surface of the toe board satisfy the following standard.
Pedal height: See the illustration (with pad) at right.
 - (2) Manually move the master cylinder push rod to see that it is in free state.



Adjusting the Brake Pedal

LAOS414

- (3) If not, change the push rod length to make it free.

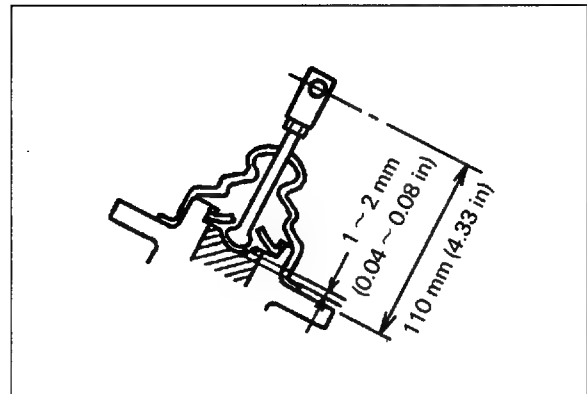
Push rod play:

1.0 ~ 2.0 mm (0.04 ~ 0.08 in)

- (4) After determining the pedal height, measure the pedal play.

Pedal play:

10 ~ 15 mm (0.4 ~ 0.6 in)



Push Rod Play

LAOS413

2. Inching pedal height and play

- (1) Adjust the pedal stopper bolt to make the inching pedal height above the top surface of the toe board satisfy the following standard:

Pedal height: 154 mm (6.0 in)

(with pad) 160 mm (6.3 in)

- (2) Adjust the inching cable to make the torque converter inching lever stroke satisfy 8 mm (0.32 in) when the links of the inching and brake pedals start inter-locked operation.

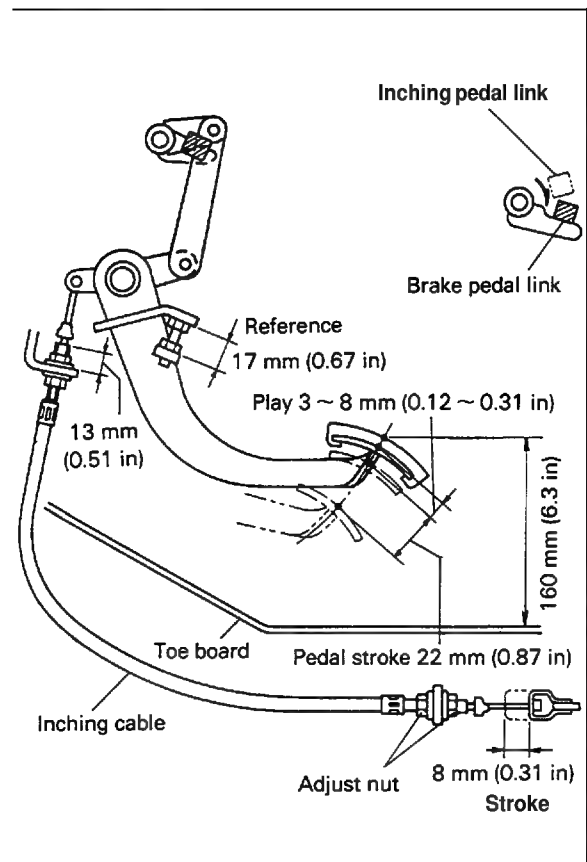
Pedal stroke at the position:

22 mm (0.87 in)

- (3) After determining the pedal height, measure the pedal play.

Pedal play:

3 ~ 8 mm (0.12 ~ 0.31 in)



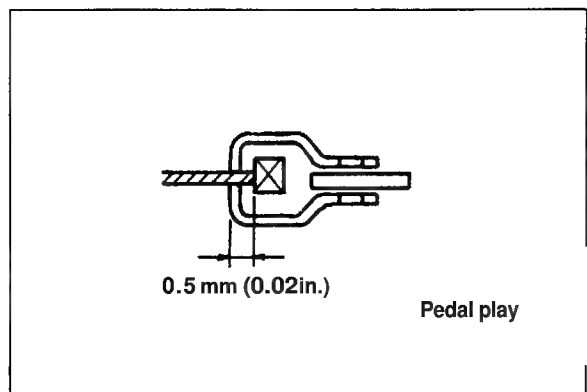
Adjusting the Inching Pedal

LAOS415

Use the play between the inching lever clevis and wire to judge the pedal play.

Wire play (reference):

0.5 mm (0.02 in)



Play between Clevis and Wire

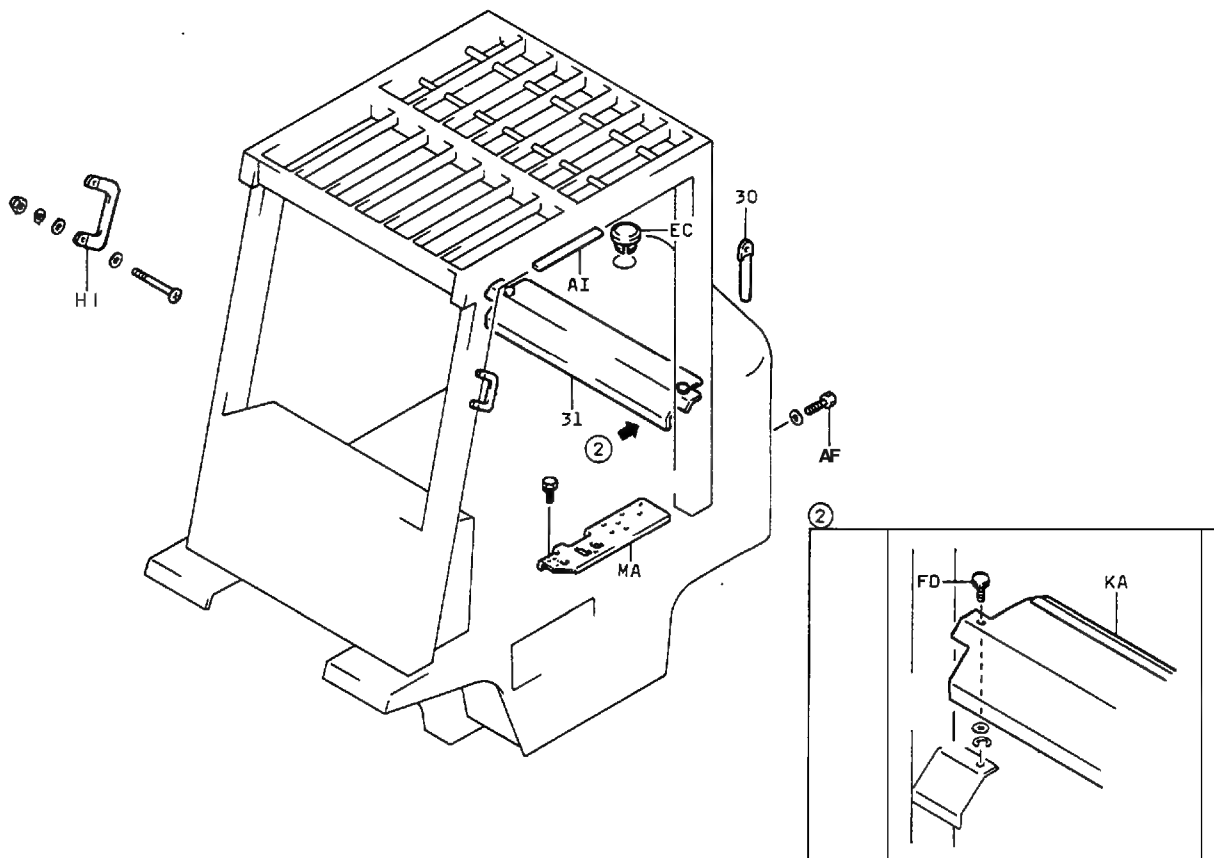
LAOS416

BODY

	Page
BODY FRAME	8-2
COMPONENTS	8-2
ENGINE HOOD REMOVAL & INSTALLATION	8-5
ENGINE HOOD LOCK CABLE REPLACEMENT	8-5
BALANCE WEIGHT REMOVAL & INSTALLATION	8-6
COMBINATION METER	8-7
COMPONENTS	8-8
REMOVAL	8-9
INSTALLATION	8-9
COMBINATION METER PARTS REPLACEMENT	8-9

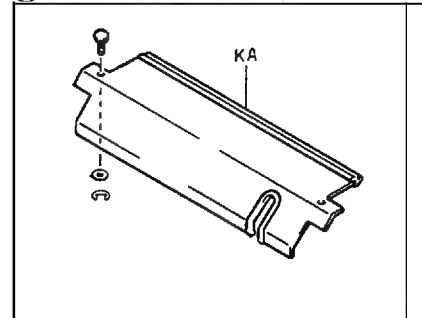
BODY FRAME

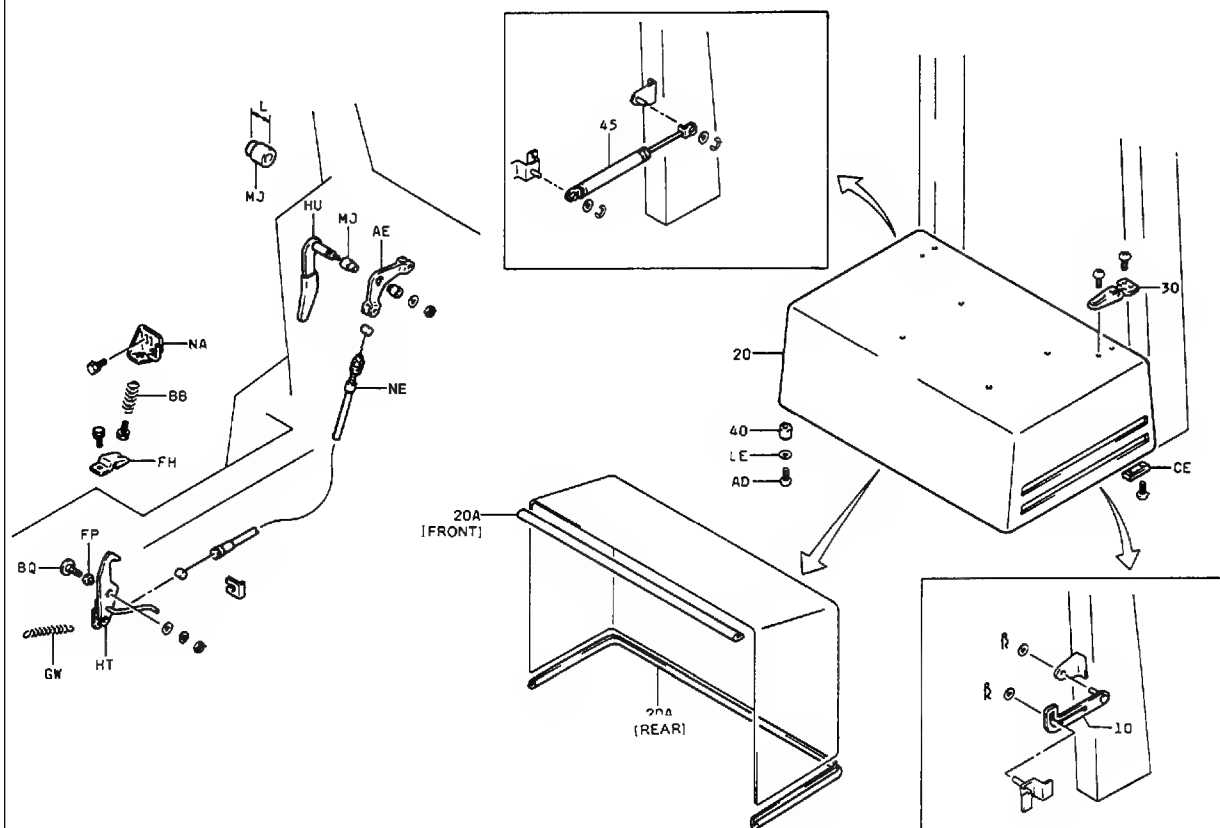
COMPONENTS



- 30 Drawbar SUB-ASSY
- 31 Cover SUB-ASSY, radiator
- AF Bolt, hexagon
- AI Sponge
- EC Cap
- FD Knob
- HI Grip
- KA Seal, rubber
- MA Bracket SUB-ASSY

(2) (CONVERTIBLE, EXCLUSIVE)



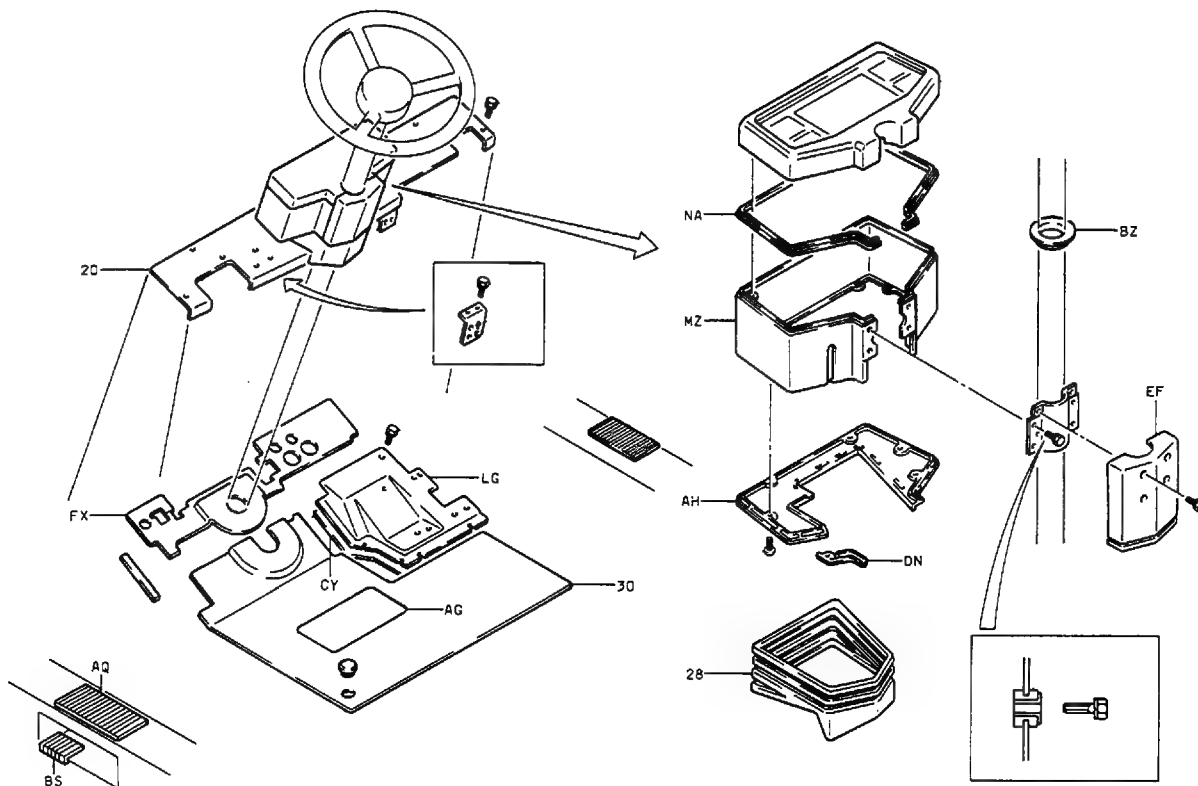


10 Stay ASSY, engine hood
 20 Hood Sub-ASSY, engine
 20A Seal, engine hood
 30 Hinge SUB-ASSY, engine hood
 40 Rubber, cushion
 45 Damper, engine hood
 AD Screw, w/toothed washer
 AE Hook, hood lock
 BB Spring
 BQ Bolt

CE Rubber, Cushion
 FH Plate
 FP Bushing
 GW Spring
 HT Plate SUB-ASSY, stopper
 HU Lever SUB-ASSY
 LE Washer, plate
 MJ Collar
 NA Striker SUB-ASSY
 NE Wire

Engine Hood Components

LARM61



20 Panel SUB-ASSY, instrument
 28 Boot
 30 Toe-board SUB-ASSY, No. 1
 AG Safety walk
 AH Cover
 AQ Safety walk
 BS Safety walk
 BZ Grommet

CY Rubber
 DN Cover
 EF Cover
 FX Cover
 LG Floor SUB-ASSY, No. 1
 MZ Box SUB-ASSY, instrument panel
 NA Packing

ENGINE HOOD REMOVAL & INSTALLATION

1. Remove the engine hood damper.
 - (1) Remove the E-ring fixing the damper, and remove the engine hood damper.

Caution:

If any abnormality of the hood damper is found, always replace it without disassembling it. Do not throw a defective damper into fire.

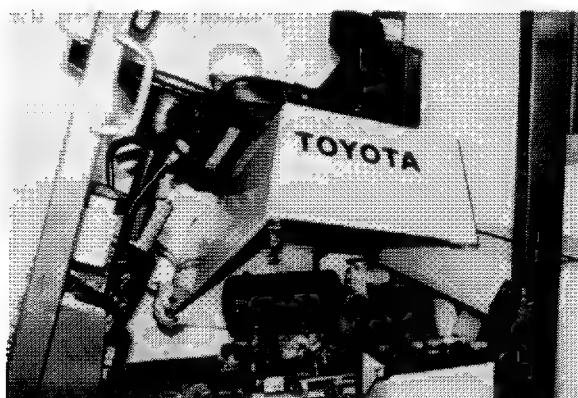
2. Disconnect the engine hood stay.
 - (1) Remove the snap pin from the mounting position on the frame side, and disconnect the engine hood stay.
3. Remove the engine hood.
 - (1) Remove the left and right hinge set bolts (two each), and remove the engine hood.
4. Install the engine hood.

Reverse of the removal procedure.



Removing the Engine Hood Damper

LAR26-4



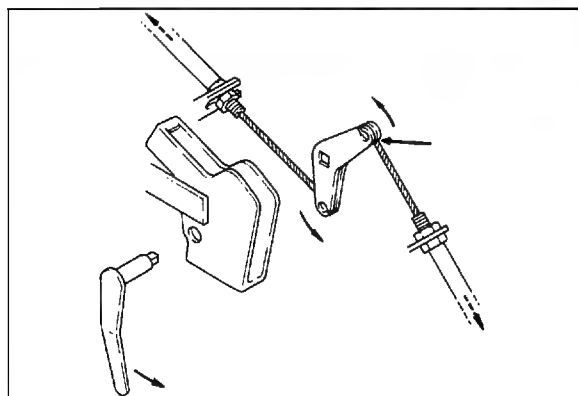
Removing the Combination Meter

LAR26-10

ENGINE HOOD LOCK CABLE REPLACEMENT

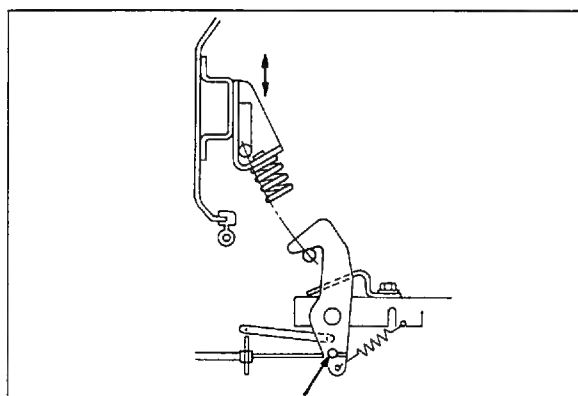
1. Open the engine hood.
2. Remove the toe board.
3. Remove the combination meter.
 - (1) Remove screws (4 pcs), and remove the cover.
 - (2) Remove combination meter set bolts (4 pcs.).
 - (3) Disconnect the electrical wiring connector, and remove the combination meter.
4. Remove the hood lock cable.
 - (1) Disconnect the cable from the hood lock hook.
 - (2) Loosen the cable lock nut, and draw out the cable.
 - (3) Disconnect the cable from the lock plate, and remove the engine hood lock cable.
5. Install the engine hood lock cable.

The reverse of the removal procedure.



Disconnecting the Cable (1)

LAOS139



Disconnecting the Cable (2)

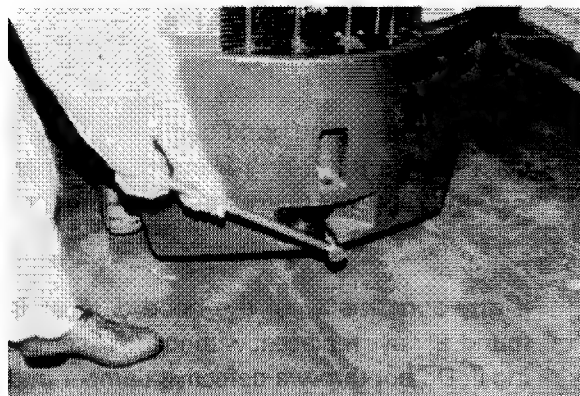
LAOS138

BALANCE WEIGHT REMOVAL & INSTALLATION

Caution:

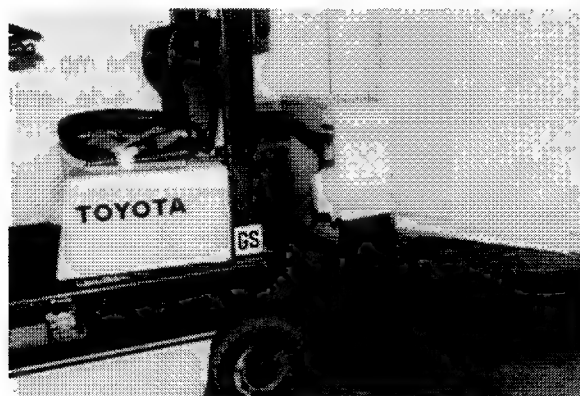
Always remove the radiator cover before removing or installing the balance weight.

2. Remove the weight set bolt:
 - (1) Use a box wrench (width across flat = 46 mm) and remove the weight set bolts.
3. Remove the balance weight.
 - (1) Slowly raise the hoist to remove the balance weight.



Removing the Weight Set Bolt

LAR28-11



Removing the Balance Weight

LAR28-14

Weight of balance weight and diameter of wire rope to be used.

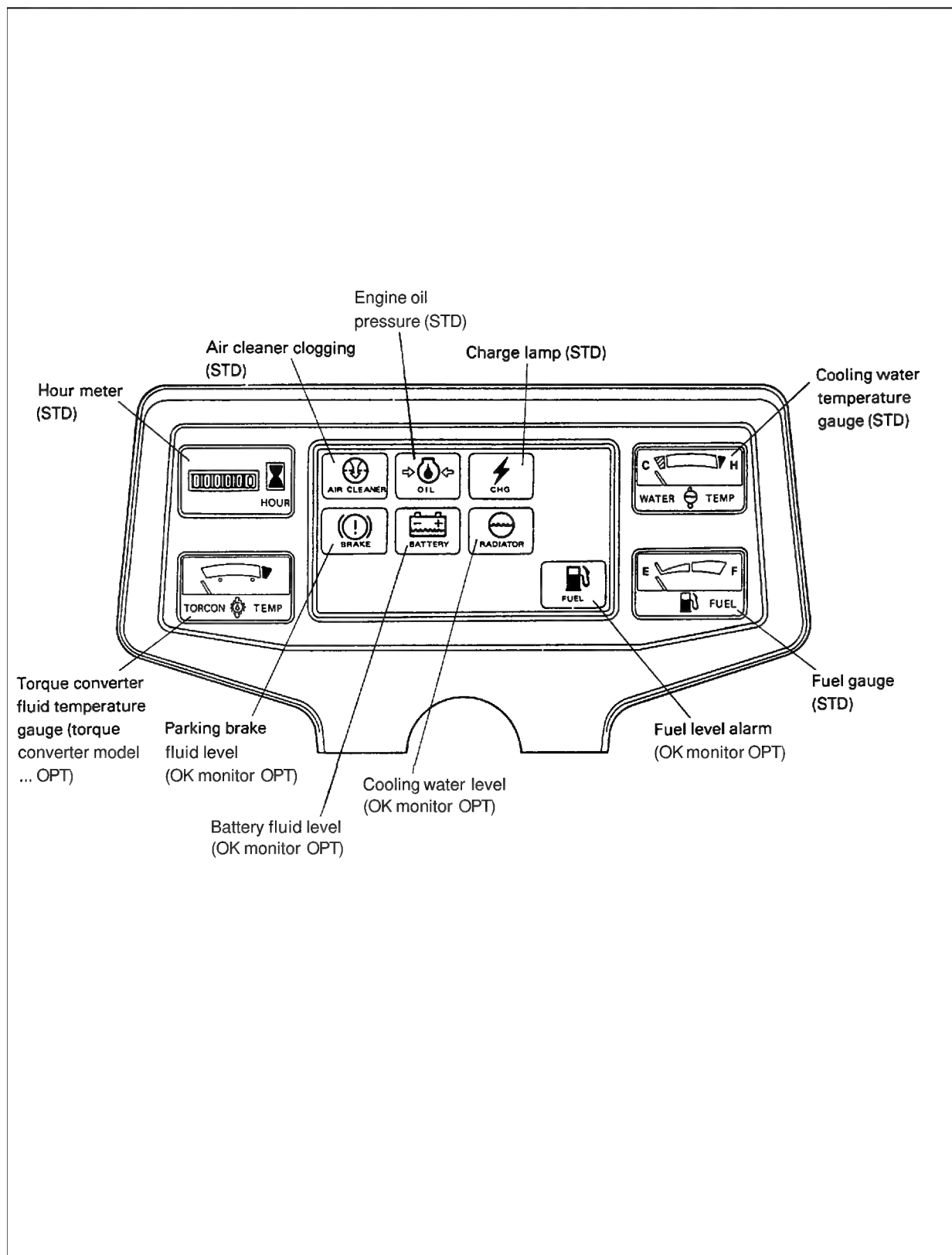
Vehicle class	Weight kg (lbs)	Wire rope diameter mm (in)
1.0 ton	495 (1100)	10 (0.394)
1.25 ton	695 (1550)	10 (0.394)
1.5 ton	895 (2000)	12.5 (0.492)

Caution:

- Carefully inspect the wire ropes for the following points:
 - Excessive number of cut strands
 - Excessive deformation and rusting
 - Thinning by 7% or more of nominal diameter
- Use a hoist or chain block with sufficient capacity.
- Always hoist vertically. Do not attempt hoisting in an oblique direction.
- When moving the hoisted weight, the height above the ground must not exceed 30 cm

COMBINATION METER

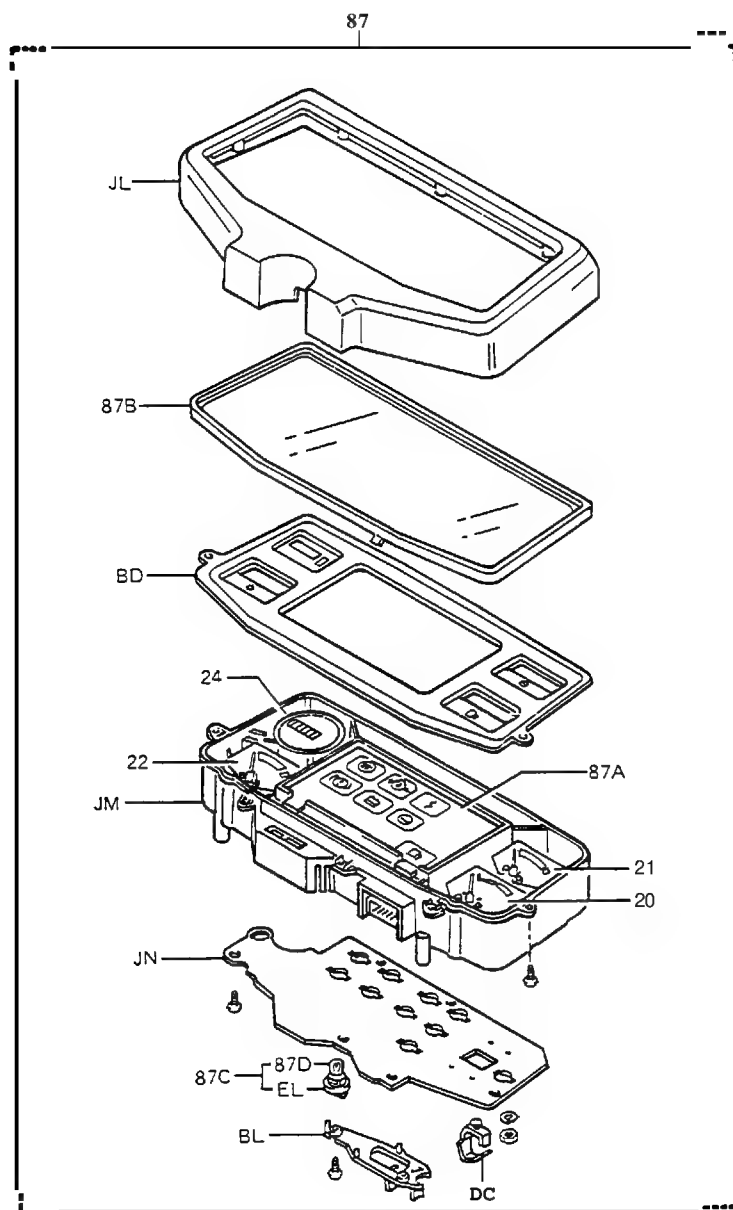
The combination meter consists of meters and warning lamps housed in one box. Early maintenance and repair are possible by checking by the combination meter for prevention of serious troubles.



Combination Meter

LAOS258

COMPONENTS



- 20 Gauge ASSY, fuel
- 21 Gauge ASSY, water temperature
- 22 Gauge ASSY, torque converter heat
- 24 Meter ASSY, hour
- 87 Meter ASSY, hour
- 47A Lens
- 47B Glass w/ packing
- 47C Valve

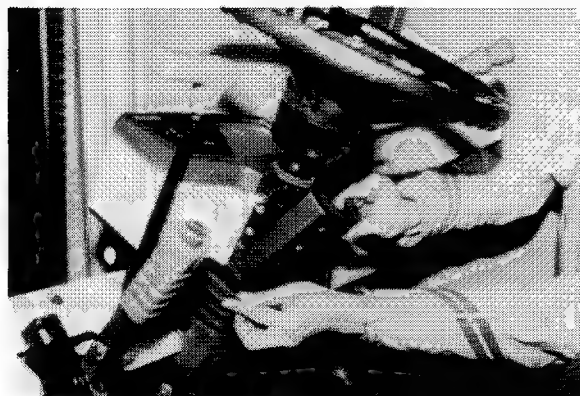
- EL Socket
- 87D Valve
- BD Plate
- BL Insulator, lower
- DC Clamp
- JL Hood
- JM Case
- JN Plate SUB-ASSY

Combination Meter Components(w/OK Monitor)

LARM63

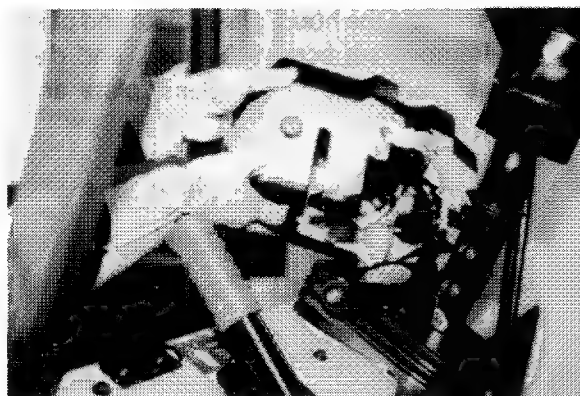
REMOVAL

1. Remove the cover.
 - (1) Remove set screws (4 pcs.), and remove the cover.
2. Remove the combination meter.
 - (1) Remove combination meter set bolts (4 pcs.).
 - (2) Disconnect the electrical wiring connector, and remove the combination meter.



Removing the Cover

LA017-36



Removing the Combination Meter

LA053-25

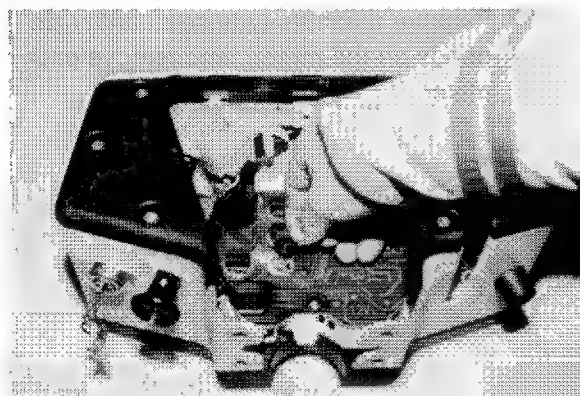
INSTALLATION

Reverse of the removal procedure.

COMBINATION METER PARTS REPLACEMENT

Warning Lamp Replacement

1. Remove the warning lamp.
 - (1) Hold the socket and turn it counter-clockwise to remove the bulb w/socket.
 - (2) Remove the bulb from the socket.
Bulb: 12V, 3W



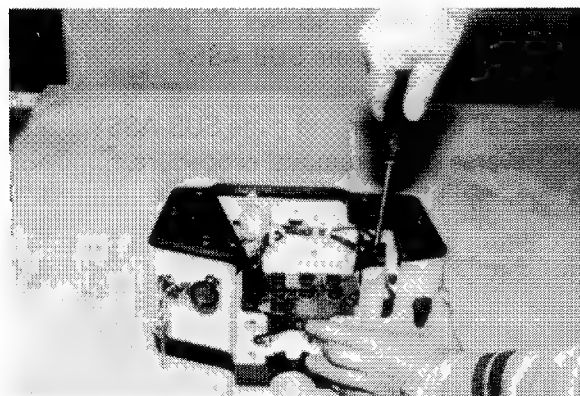
Removing the Bulb w/Socket

LA053-18

2. Install the warning lamp.
Reverse of the removal procedure.

Meter Plate SUB-ASSY Replacement

1. Remove the cover.
 - (1) Remove screws (6 pcs.), and remove the cover.

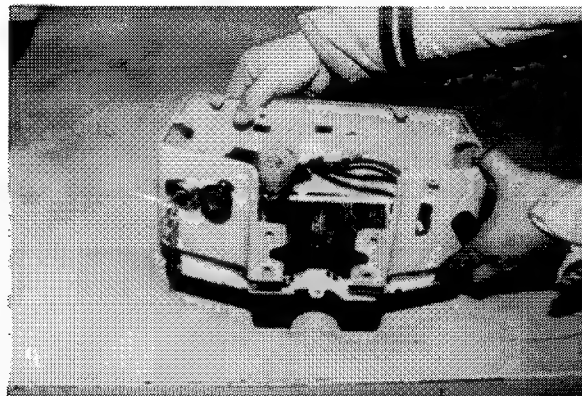


Removing the Cover

LA053-19

Remove the instrument panel box.

- (1) Remove screw (6 pcs.), and remove the instrument panel box.

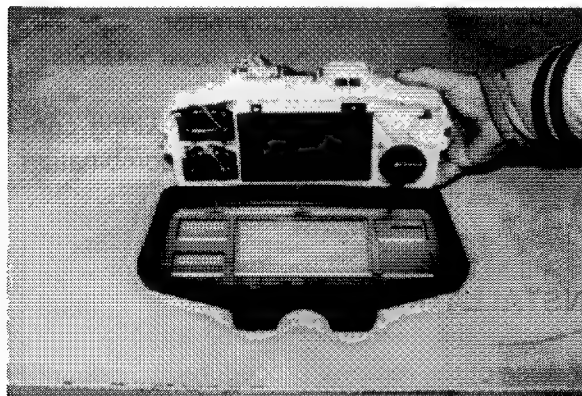


Removing the Instrument Panel Box

LA053-20

Disassemble the hood, glass, plate and case

- (1) Remove set screws (8 pcs.), and disassemble the hood, glass, plate and case.



Disassembling the Case and Other Parts

LA053-23

- (2) Remove the nuts (whose quantity depends on the meter), and remove each meter.

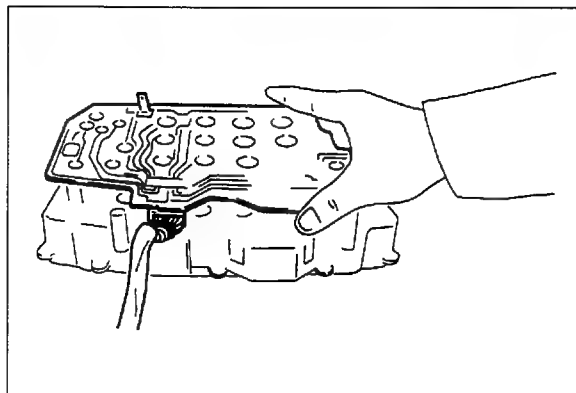


Removing the Meter

LA0124-2

- (3) Remove set screws (6 pcs.), and remove the plate SUB-ASSY.

4. Install the meter and plate SUB-ASSY. Reverse of the removal procedure.



Removing the Plate SUB-ASSY

LA0S434

Switch Replacement

1. Remove the lighting switch.
 - (1) Remove the switch knob set screw, and remove the switch knob.
 - (2) Remove the ring nut, and remove the lighting switch.



Removing the Lighting Switch

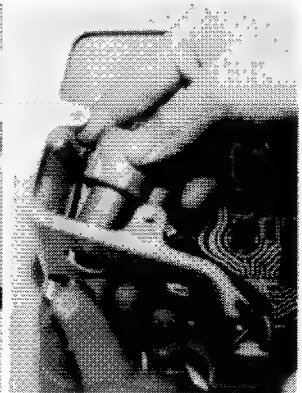
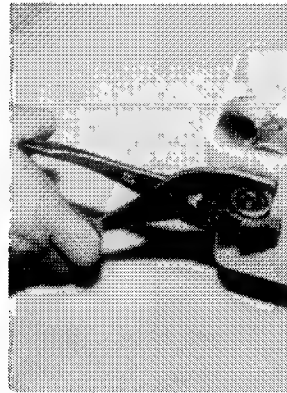
LA0125-14,15

Remove the key switch.

- (1) Remove the ring nut, and remove the key switch.

Install the switch.

Reverse of the removal procedure.



Removing the Key Switch

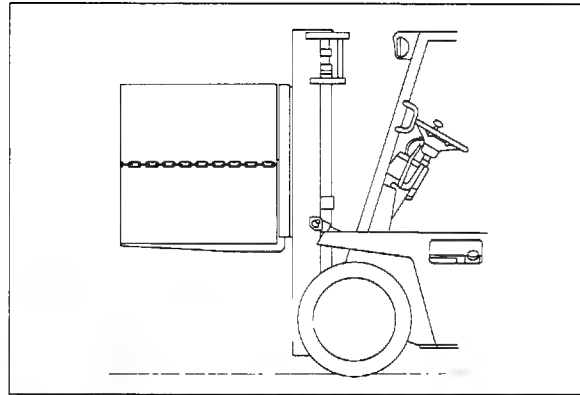
LA0125-16,17

MATERIAL HANDLING SYSTEM

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NATURAL DROP TEST

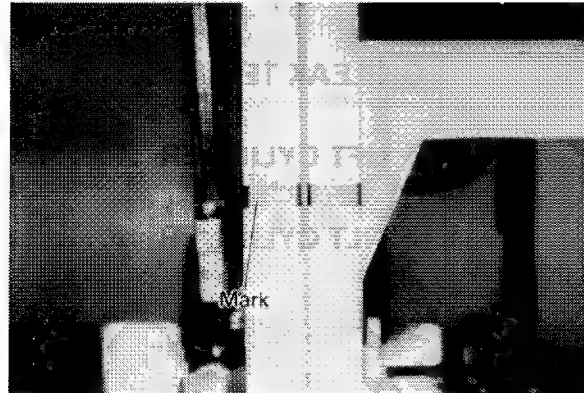
1. Set the mast in the vertical position with the standard load on the fork. Lift the fork by 1 — 1.5 m (40 — 60 in). and stop the engine.



Standard Load State

LARM71

2. Draw datum lines on the inner and outer masts, and measure the drop in 15 minutes.
Natural drop amount: 160 mm (6.3 in)

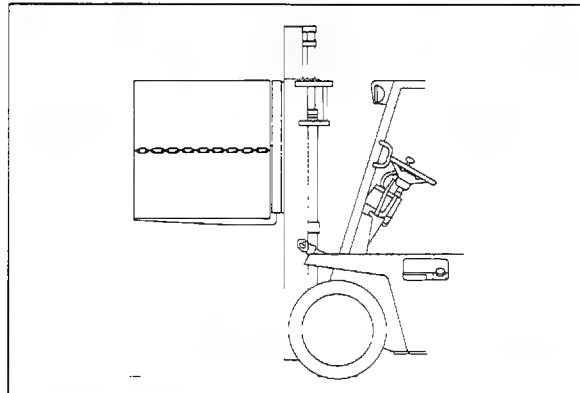


Natural Drop Test

LAR28-15

NATURAL FORWARD TILT TEST

1. Set the mast in the vertical position with the standard load on the fork.
Lift the fork by about 50 cm (20 in), and stop the engine.

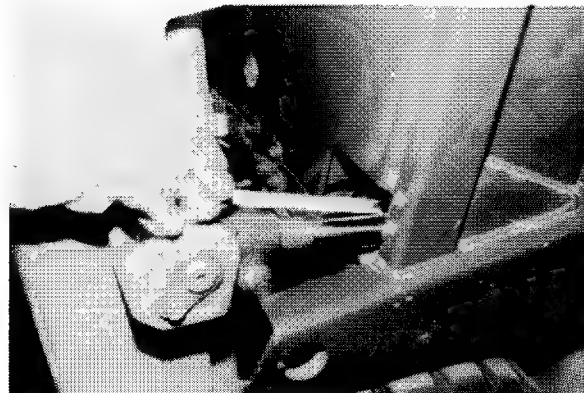


Standard Load State

LARM72

Measure the cylinder rod extension in 15 minutes.

Natural forward tilt amount:
8 ~ 30 mm (0.32 ~ 1.2 in)



Natural Forward Tilt Test

LAR28-18

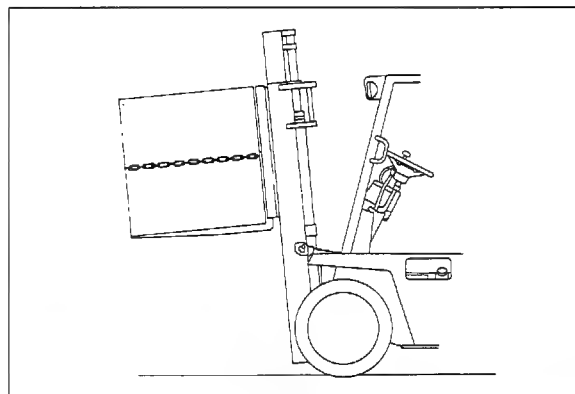
OIL LEAK TEST

LIFT CYLINDER

1. Set the mast in vertical position with the standard load on the fork.
Raise the fork by 1 ~ 1.5 m (40 ~ 60 in).
2. Gently tilt the fork fully forward and then stop the engine. After 5 minutes, disconnect the hose connecting oil control valve and oil tank hose. Place a measuring cylinder under the elbow and measure the amount of leaking oil in the minute.
Standard oil leak amount (at lift port):
6 to 16 cc (0.37 to 0.88 cu.in)

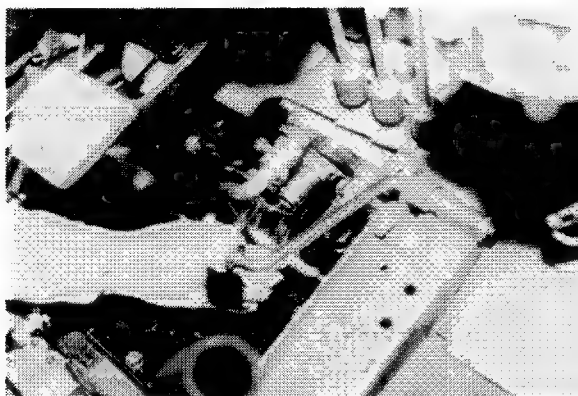
Caution:

If the natural drop is great though the oil leak amount is within the standard, the lift cylinder packing is defective.



Standard Load State (Forward Tilt)

LARM73



Oil Leak Test (at Lift Port)

LAR28-20

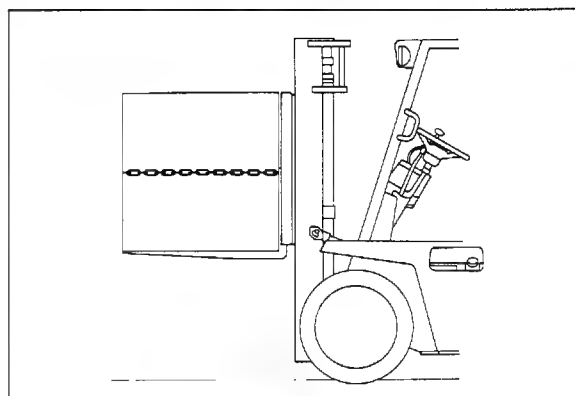
TILT CYLINDER

1. Set the mast in the vertical position with the standard load on the fork, and lift the fork by about 50 cm (20 in).
2. Stop the engine and wait for 5 minutes. Then, disconnect the hose connecting the oil control valve and oil tank. Place a measuring cylinder under the elbow and measure the amount of leaking oil in one minute.
Standard oil leak amount (total of lift and tilt): 14 ~ 34 cc (0.86 to 2.07 cu.in)

The leak amount at the tilt port is the total leak amount (including lift).

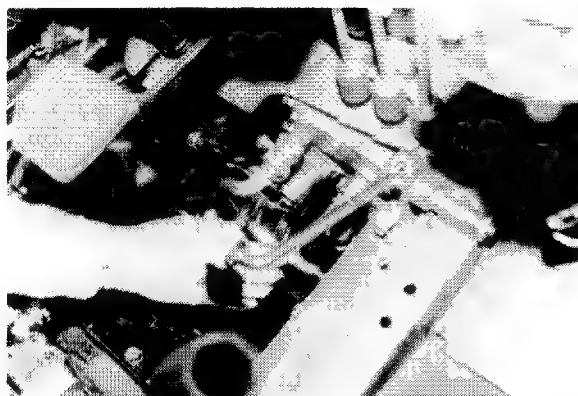
Note:

If the natural forward tilt is great though the oil leak amount is within the standard, the tilt lock valve or tilt cylinder packing is defective.



Standard Load State (Neutral)

LARM74



Oil Leak Test (Total Amount)

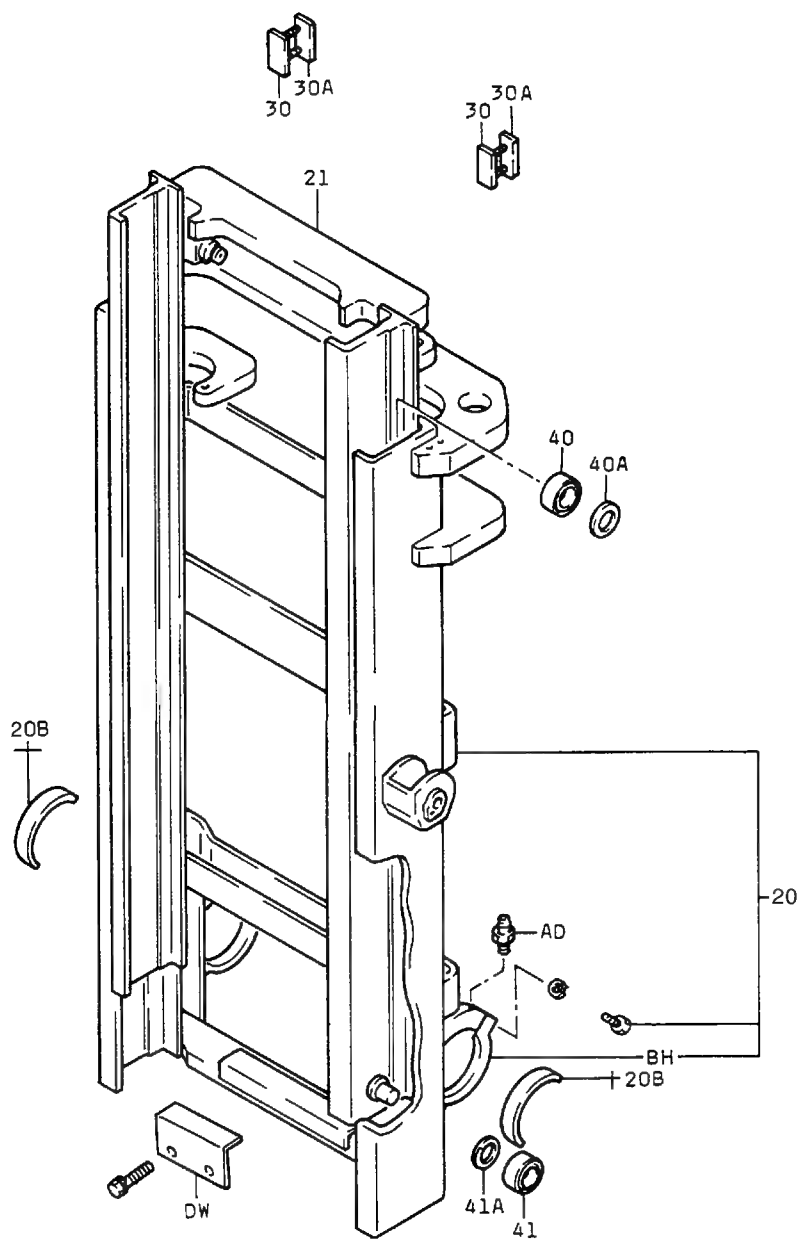
LAR28-20

MAST

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V MAST ASSY

COMPONENTS

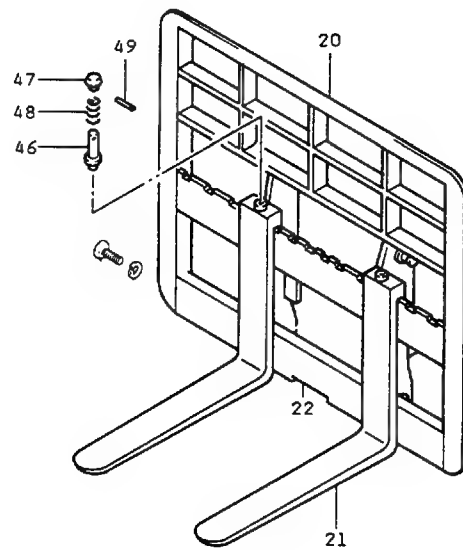


20 Mast SUB-ASSY, outer
 20B Bushing, mast support
 21 Mast SUB-ASSY, inner
 30 Strip SUB-ASSY, outer mast
 30A Shim, outer mast strip
 40 Roller, lift (for outer mast)

40A Shim, lift roller (for outer mast)
 41 Roller, lift (for inner mast)
 41A Shim, lift roller (for inner mast)
 AD Fitting, grease
 BH Cap, mast support
 DW Cover, hose

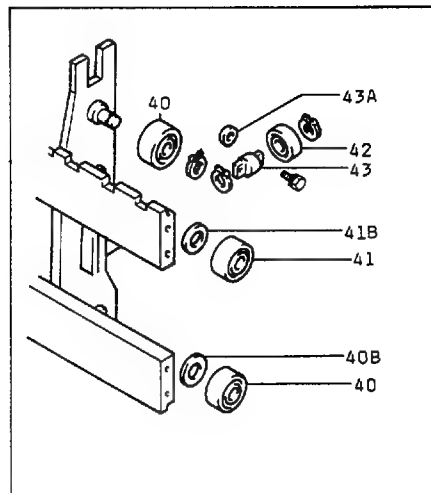
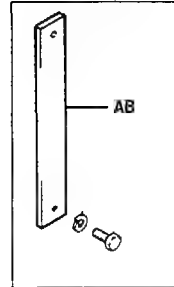
Mast Components (V)

LARM24

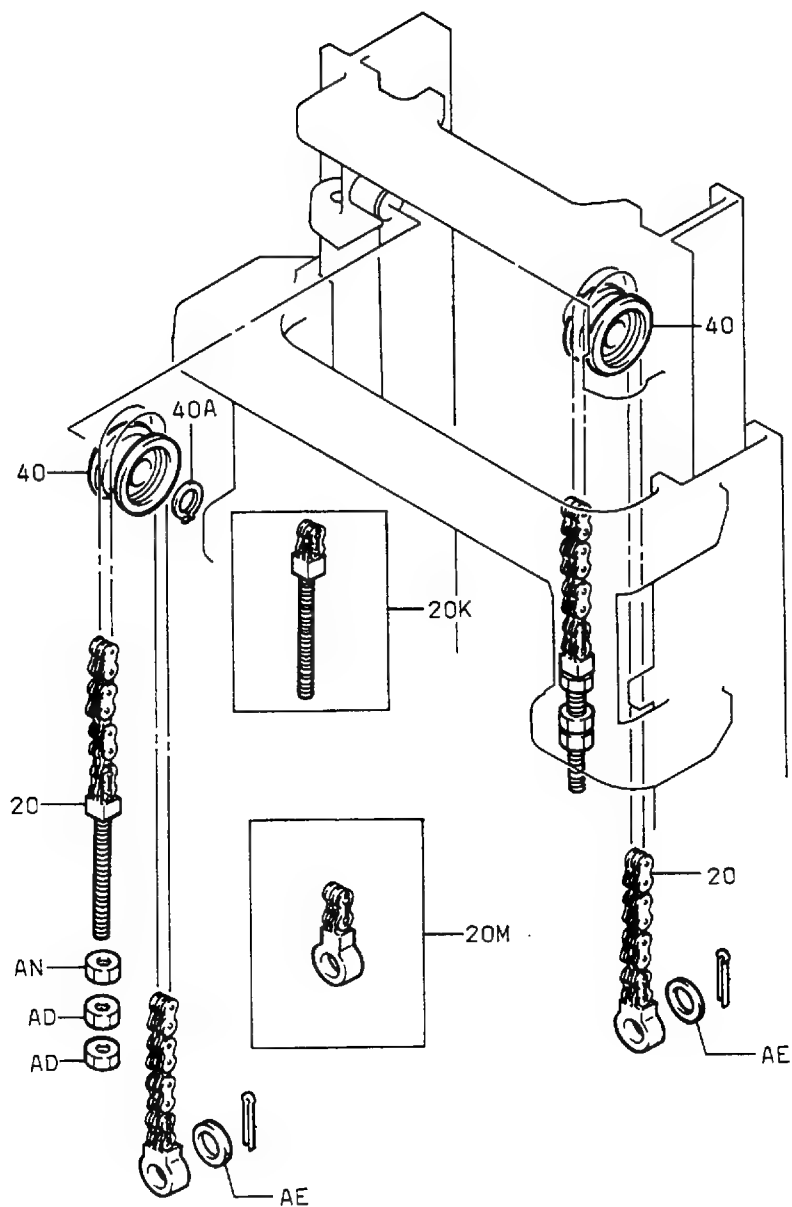


(V)

(L/BACK REST)



- | | | | |
|-----|-----------------------------|-----|------------------------------------|
| 20 | Backrest SUB-ASSY | 43 | Shaft, side roller |
| 21 | Fork SUB-ASSY | 43A | Shim (for side roller shaft) |
| 22 | Bracket SUB-ASSY, lift | 46 | Pin, fork stopper |
| 40 | Roller, lift (upper, lower) | 47 | Knob, fork stopper pin |
| 40B | Shim, lift roller | 48 | Spring, fork stopper pin |
| 41 | Roller, lift (center) | 49 | Pin, spring (for fork stopper pin) |
| 41B | Shim (center) | AB | Plate, side |
| 42 | Roller, side | | |



20 Chain SUB-ASSY
 20K Bolt kit, chain anchor, No. 1
 20M Bolt kit, chain eye
 40 Wheel, chain

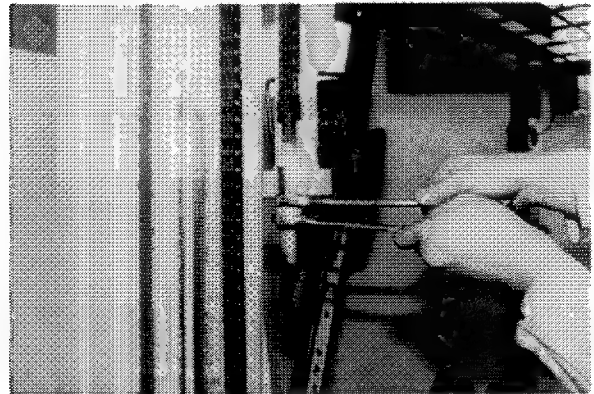
40A Ring, shaft snap (for chain wheel)
 AD Nut, hexagon
 AE Washer, chain special
 AN Nut, hexagon

REMOVAL

Caution:

- Check the operation of the mast and the related parts and the clearance between the rollers to check any defect correctly before removing the mast.
- When removing the mast assy after removing the lift bracket, it can be comparatively easily removed.

1. Disconnect the chain.
 - (1) Lower the lift bracket fully and tilt it forward slightly to slacken the chain.
 - (2) Chain adjustment nut and lock nut



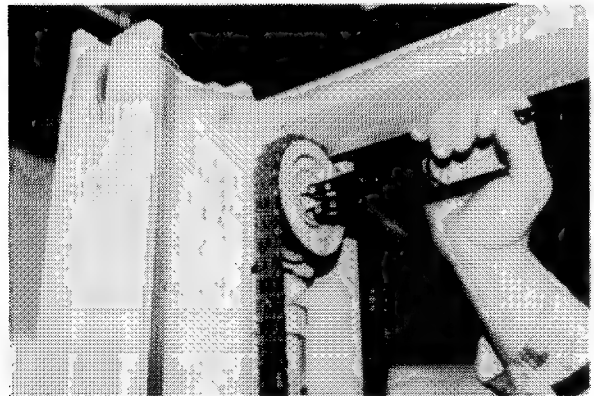
Disconnecting the Chain

LAR36-13

2. Remove the chain wheel.
 - (1) Snap ring
 - (2) Chain wheel

Note:

When the chain wheel is firmly fit, use SST 09950-20017.



Removing the Chain Wheel

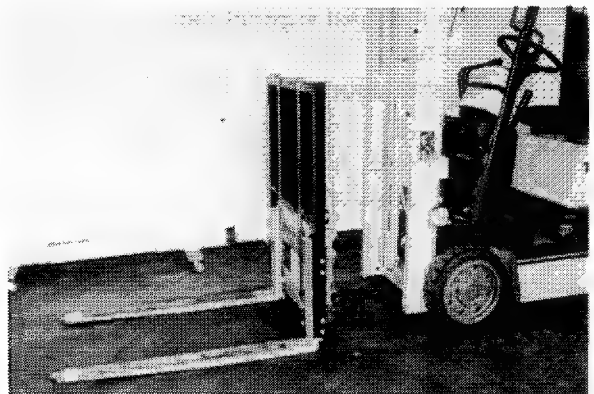
LAR36-15

3. Remove the lift bracket.
 - (1) Erect the mast vertically. Raise the inner mast until it comes off the lift bracket.

Caution:

When raising the inner mast, pay attention so that the slackened chain does not tangle around the inner mast.

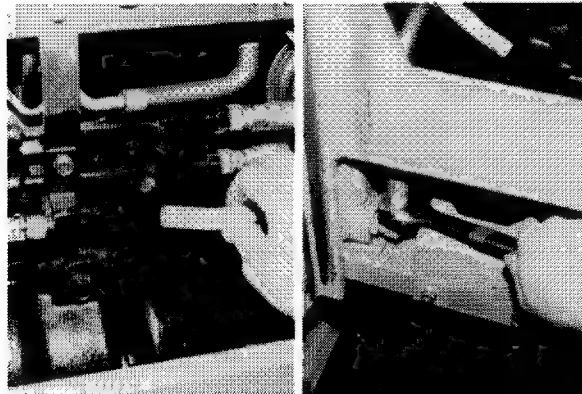
- (2) Slowly move the vehicle in reverse direction.



Removing the Lift Bracket

LAR36-19

4. Disconnect the hose
 - (1) Lower the inner mast fully.
 - (2) Overflow hose (on the 3-way side)
 - (3) High pressure hose



Disconnecting the Hose

LAR36-40,37-3

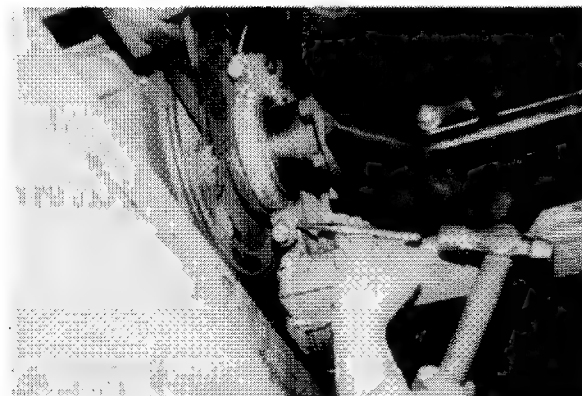
5. Hook a wire to the mast hook and lift the mast slightly.



Lifting the Mast

LAR37-5

6. Stamp the match mark on the mast support cap.



Stamping the Match Mark

LAR37-7

7. Remove the mast support cap.
 - (1) Set bolts
 - (2) Mast support cap

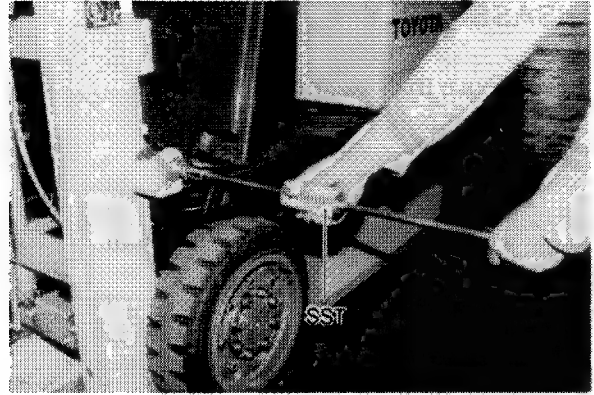


Removing the Mast Support

LAR37-10

Remove the tilt cylinder front pin.

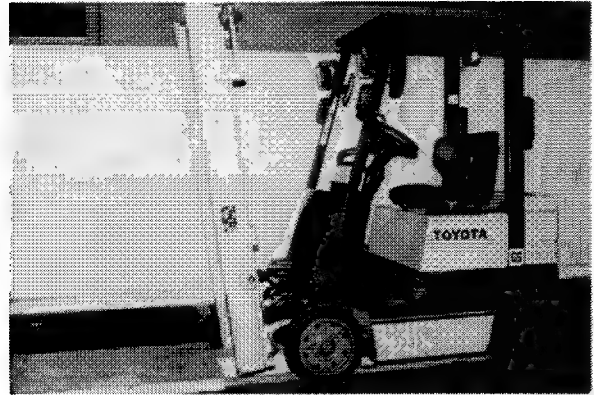
- (1) Set bolts
- (2) Front pin
SST 09810-20172-71



Removing the Front Pin

LAR37-14

9. Remove the Mast ASSY



Removing the Mast ASSY

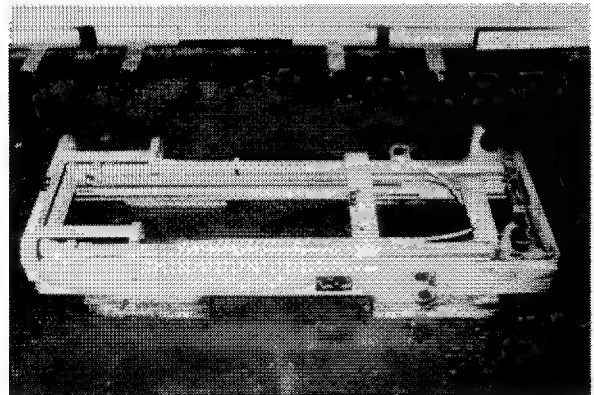
LAR37-16

10. Lay down the mast.

Lay down the mast with the outer mast side down on a block and the mast tie beam side up so that the inner mast can slide.

Caution:

- **Never lean the removed mast against the wall, etc. Lay down it at the height as low as possible.**
- **Place the removed mast in a wide margin in the up and down directions and the mast sliding direction (about one mast length) to disassembly it freely.**



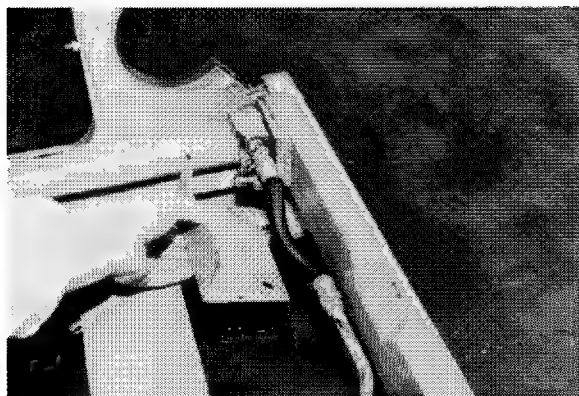
Laying-down the Mast

LAR37-18

DISASSEMBLY

1. Remove the hose cover.

- (1) Set bolts
- (2) Hose cover

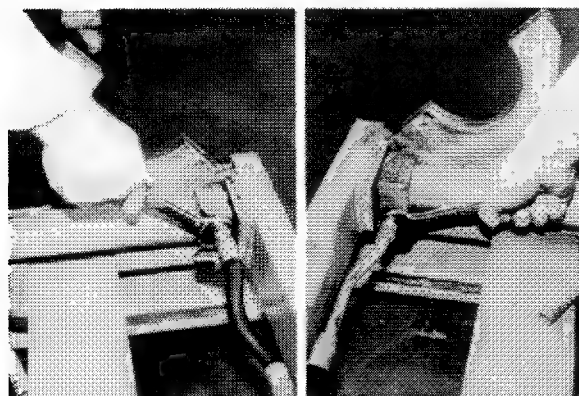


Removing the Hose Cover

LAR37-24

2. Disconnect the hose.

- (1) High pressure hose

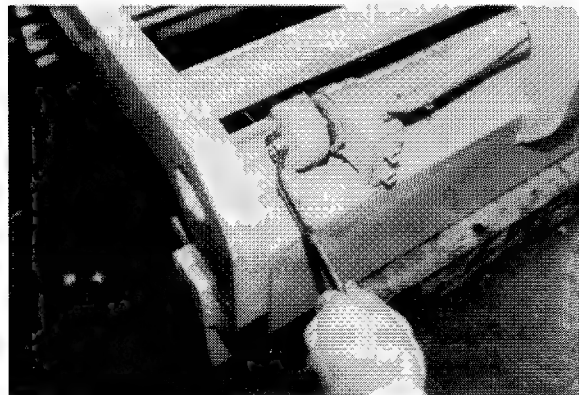


Disconnecting the Hose

LAR37-26,28

3. Disconnect the cylinder rod end.

- (1) Set bolts



Removing the Set Bolts

LAR37-32

- (2) Pull out the cylinder rod from the inner mast.

- 1) Shims
- 2) Washer

Caution:

To prevent the uneven motion of right and left cylinders, adjust the shims at the lift cylinder rod end. Remember which cylinder is used for adjustment, the right cylinder or the left cylinder. Also remember the number of the shims.

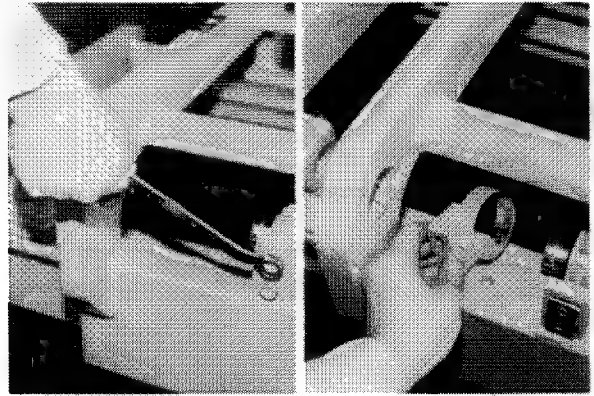


Disconnecting the Cylinder Rod End

LAR37-36

Remove the lift cylinder support

- (1) Set bolts
- (2) Plate
- (3) Spacer
- (4) Rubber
- (5) Plate
- (6) Shim
- (7) Lift cylinder support



Removing the Lift Cylinder Support

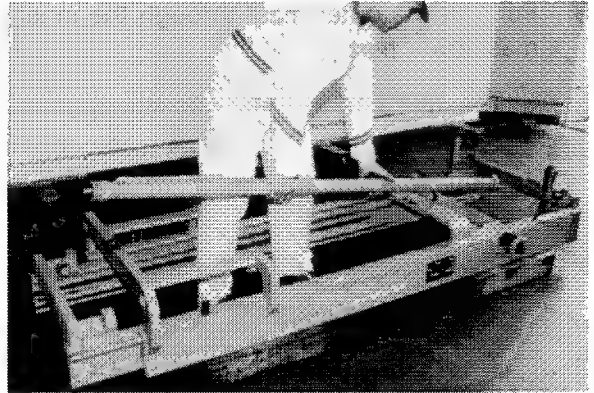
LAR38-3.6

Remove the lift cylinder

- (1) Slide the inner mast up almost fully.
- (2) Lift cylinder

Caution:

When removing the lift cylinder, pay attention so as not to damage the lift cylinder bottom.



Removing the Lift Cylinder

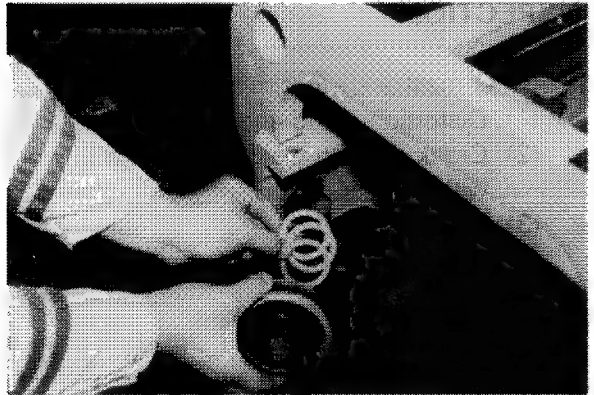
LAR38-7

Remove the lift roller.

- (1) Outer mast lift roller
- (2) Shim

Note:

When the lift roller is firmly fit, use SST 09950-20017.



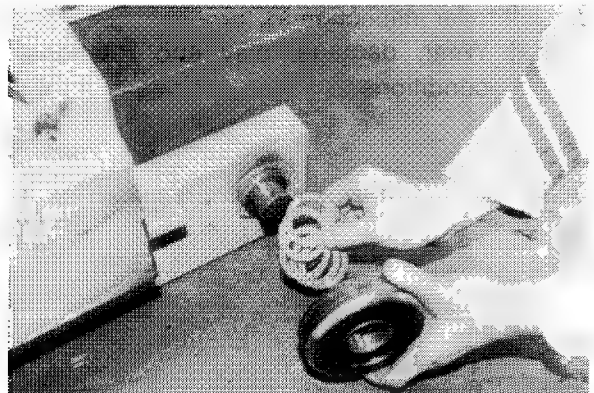
Removing the Lift Roller

LAR38-14

- (3) Inner mast lift roller
- (4) Shim

Note:

When the lift roller is firmly fit use SST 09950-20017.



Removing the Lift Roller

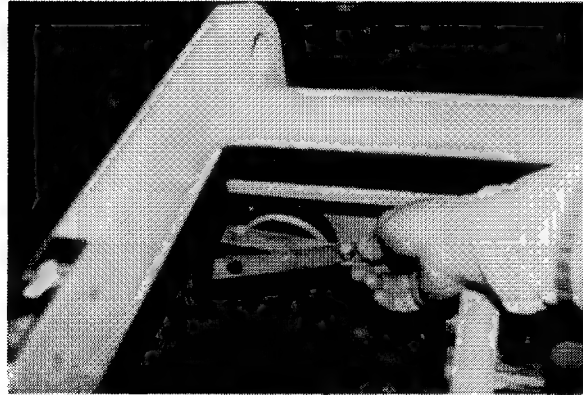
LAR38-16

7. Remove the mast strip.

- (1) Mast strip
- (2) Shim

Note:

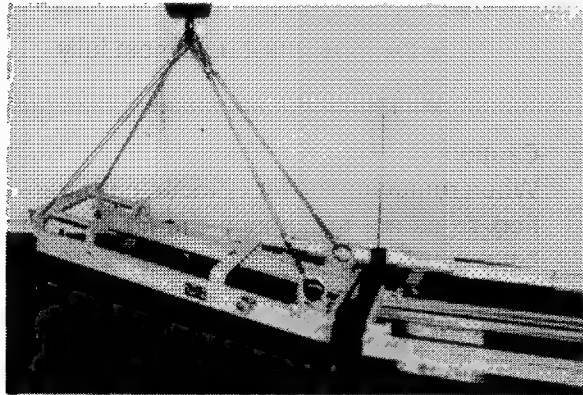
Replace the mast strip when no oil is retained.



Removing the Mast Strip

LAR38-8

8. Pull out the outer mast through the inner mast lower part.



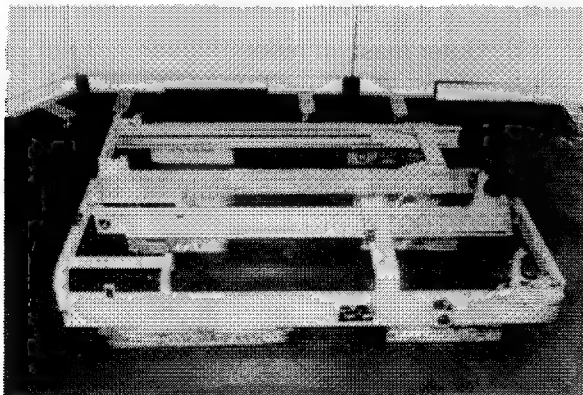
Removing the Outer Mast

LAR38-19

INSPECTION

1. Outer mast and inner mast inspection

- (1) Distortion, bend and biting
- (2) Crack of each welded part (visually or with a collar check)
- (3) Expansion



Inspecting the Mast

LAR38-20

2. Lift roller inspection

- (1) Wear, damage, play and rotational conditions



Inspecting the Lift Roller

LAR38-23

(2) Lift roller list

Application		Item	Dimension
Inner mast lower section (2 pieces)	outside diameter mm (in)	Standard value	114.5 (4.5)
		Limit value	113.5 (4.46)
	inside diameter mm (in)	Standard value	35.0 (1.378)
		Limit value	35.2 (1.380)
Outer mast upper section (2 pieces)	outside diameter mm (in)	Standard value	94.5 (3.72)
		Limit value	93.5 (3.68)
	inside diameter mm (in)	Standard value	35.0 (1.378)
		Limit value	35.02 (1.380)
Lift bracket upper and lower section (4 pieces)	outside diameter mm (in)	Standard value	94.5 (3.72)
		Limit value	93.5 (3.68)
	inside diameter mm (in)	Standard value	35.0 (1.378)
		Limit value	35.02 (1.380)
Lift bracket central section (2 pieces)	outside diameter mm (in)	Standard value	93.3 (3.67)
		Limit value	92.5 (3.64)
	inside diameter mm (in)	Standard value	35.0 (1.378)
		Limit value	35.02 (1.380)
Lift bracket side roller upper section	outside diameter mm (in)	Standard value	65.0 (2.56)
		Limit value	64.0 (2.52)
	inside diameter mm (in)	Standard value	25.0 (0.984)
		Limit value	25.02 (0.985)

Application		Item	Dimension
Inner mast lower section (2 pieces)	outside diameter mm (in)	Standard value	115.1 (4.53)
Lift bracket upper and lower section (4 pieces)			95.0 (3.74)
			95.6 (3.76)

3. Mast strip inspection

- (1) Damage, biting and deformation
- (2) Wear

Caution:

Replace when oil pockets are worn out.



Inspecting the Mast Strip

LAR38-25

ASSEMBLY

Caution:

- Assemble each roller of the mast sequentially while adjusting the shim according to the mast adjustment standard.
- Apply MP grease to the inner mast sliding face of the mast strip.

1. Select the lift roller shims.

Note:

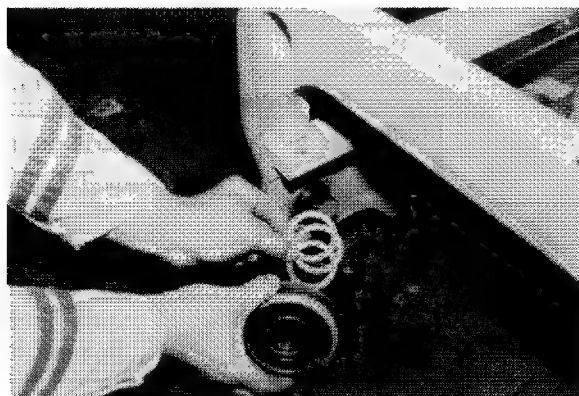
- Add the shims to stop the gap caused **after** the mast clearance measurement.
- Shim thickness: **0.5 and 1.0 mm (0.02 and 0.04 in.)**

2. Insert the outer mast through the inner mast lower part.

Note:

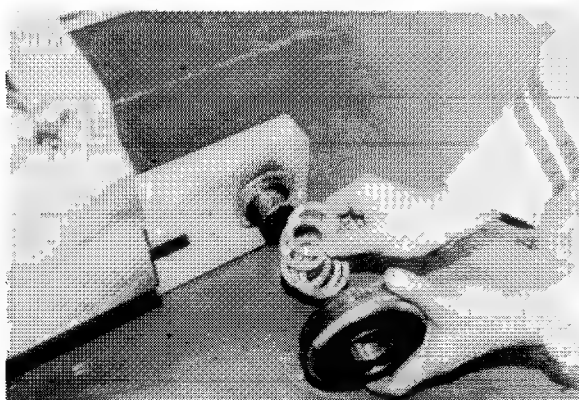
Place a block under the outer mast side so that the inner mast can slide as before disassembly.

3. Install the mast strip.
4. Install the lift roller.
SST 09370-20270-7 1
5. Reverse the disassembly procedure for the subsequent operations.



Selecting the Shims (Outer Mast Roller)

LAR38-16



Selecting the Shims (Inner Mast Roller)

LAR38-14

INSTALLATION

Reverse the removal procedure for installation.

Caution:

- Before assembly, apply chassis grease special to the mast support bushing and the tilt cylinder front pin.
- When installing the mast support cap and the tilt cylinder front pin, confirm that the match marks.
- When replacing the old mast ASSY outer mast, inner mast or lift cylinder with a new one, check the uneven motion of the lift cylinder and adjust it, if necessary. See Lift cylinder rod shim adjustment section for the inspection and adjustment methods.

LIFT BRACKET

REMOVAL

Note:

- When replacing the old lift bracket roller with a new one or when adjusting the shims, be sure to remove the bracket.
- See Mast Assy removal, paragraph 1 through 3 for the lift bracket removal procedure.

1. Remove the lift bracket.

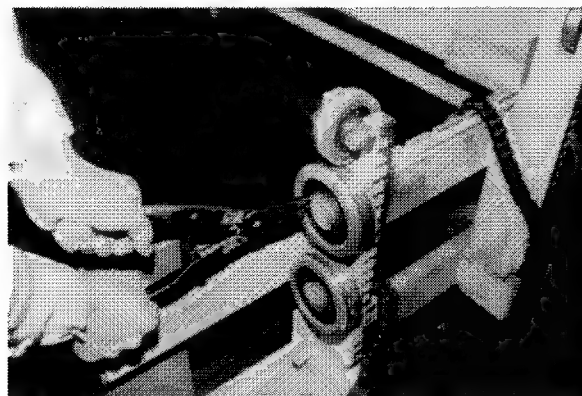


Removing the Lift Bracket

LAR36-19

DISASSEMBLY

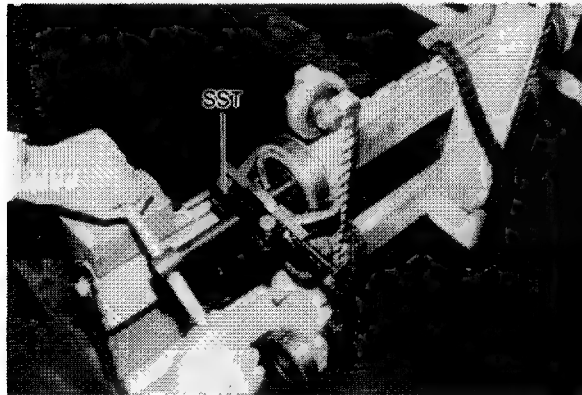
1. Remove the lift roller.
 - (1) Snap ring



Removing the Snap Ring

LA0114-12

- (2) Lift roller
SST 09950-20017
 - (3) Shim

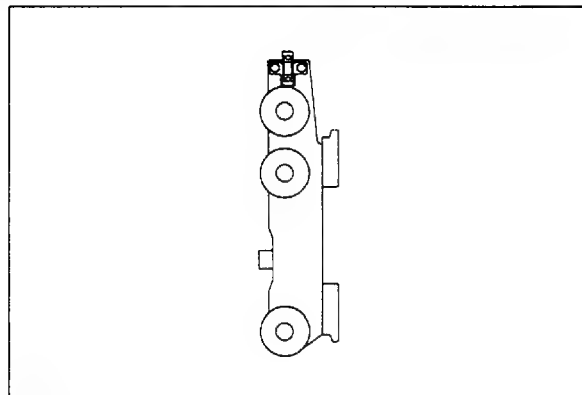


Removing the Lift Roller

LA0114-23

ASSEMBLY AND INSTALLATION

Reverse the disassembly procedure and the removal procedure for assembly and installation.



Lift Roller

LA0S378

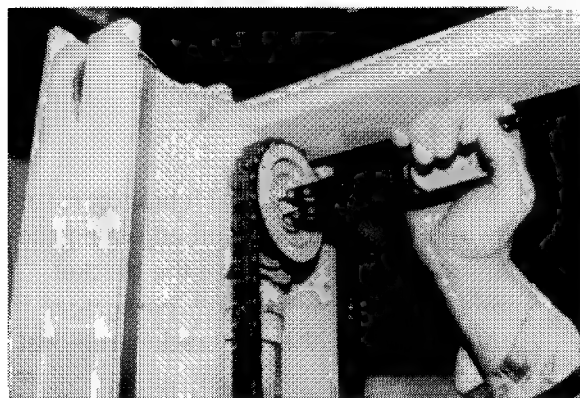
CHAIN WHEEL AND CHAIN

REMOVAL

Note:

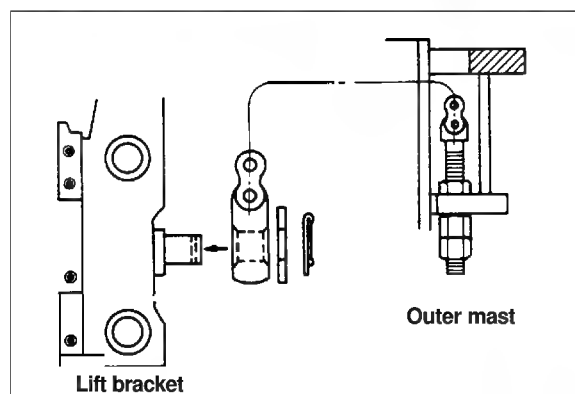
- See Mast ASSY removal section, paragraph 1 and 2 for the chain wheel removal procedure.
- See the Mast ASSY removal section, paragraph 1 through 3 for the removal procedure up to the lift bracket removal of the chain. See the paragraph 2 given below for the subsequent operation.

1. Remove the chain wheel.
 - (1) Snap ring
 - (2) Chain wheel
2. Remove the chain (on the lift bracket side)
 - (1) Cotter pin
 - (2) Plate washer
 - (3) Chain



Removing the Chain Wheel

LAR36-15

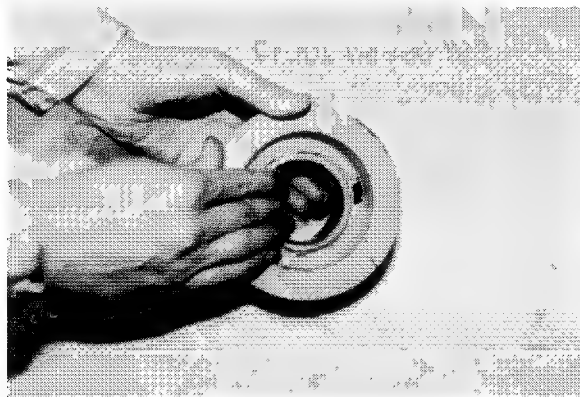


Removing the Chain

LAOS380

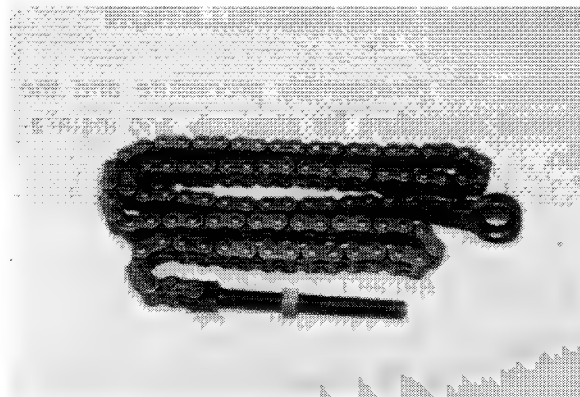
INSPECTION

1. Chain wheel inspection
 - (1) Damage and crack
 - (2) Rotational conditions, abnormal sound and play of the chain wheel bearing.
2. Chain inspection
 - (1) Elongation and crack
 - (2) Damage and bend (Anchor bolts)
 - (3) Link movement



Inspecting the Chain Wheel

LAQ64-12



Inspecting the Chain

LAO114-21

INSTALLATION

Reverse the removal procedure for installation.

Caution:

- See the Chain adjustment section for the correct installation.
- Tighten the adjustment nut so that the chain becomes in parallel with the chain wheel.

Tighten the adjustment nut according to the procedure given below.

Outer mast side

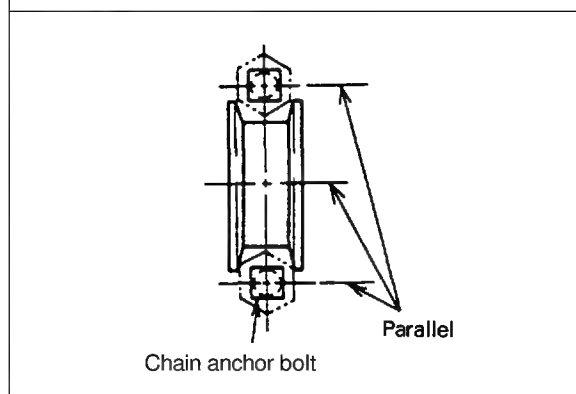
1. Tighten the nuts ①, ②.
 $T = 5.0 \sim 8.0 \text{ kg-m}$
 $(36.1 \sim 57.6 \text{ ft-lb})$
2. Tighten the nuts ③

ADJUSTMENT

1. Position the vehicle on a flat place and move the mast to vertical position.
2. After moving the fork without load upward and downward for several times, see if the tension of the right and left chains is equal.
3. To prevent slackening of the chain, adjust the adjust nut (on the lift cylinder side) so that the bottom of the fork will be in contact with the ground.

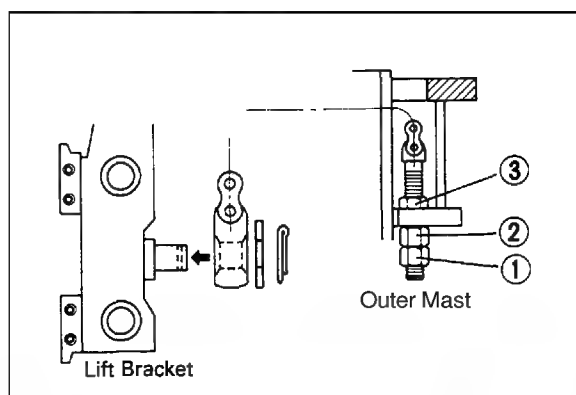
Note:

- Clearance between the bottom of the fork and the ground should be measured at the following positions:
 - Fork is positioned at measurements h; and the lift bracket roller bottom is positioned within measurements A.
 - When the fork is to the maximum height, the chain wheel should not be closer to the chain anchor on the lift bracket side than measurements B.
4. Make sure the tension of the right and left chains is equal.
 5. Make sure the fork reaches the regular lifting height.



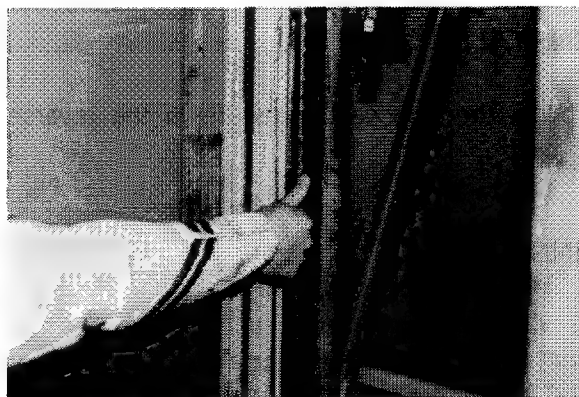
Installing the Chain (1)

LARS34



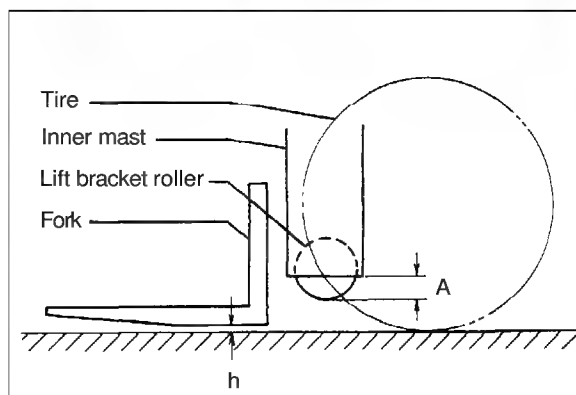
Installing the Chain (2)

LAOS380



Checking the Chain Tension

LA0117-13



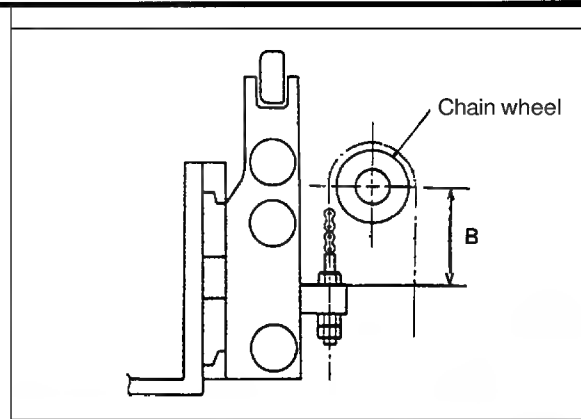
Chain Adjustment with the Fork Down

LAES21

h mm (in)	A mm (in)	B mm (in)
0—10 (0—0.39)	2.5 (0.098)	106 (4.17)

Note:

- Measurement **A** apply when the measurement **h** is zero.
- Measurement **B** is for reference.



Chain Adjustment with the Fork at the Top

LAOS382

FORKS

REMOVAL

1. Raise the forks by about 20 cm (7.88 in.).
2. Place a block under the lower part of the notches of the fork rails.
3. Move the forks one by one to the center.
4. Lower forks to remove them.



Removing the Fork

LAO114-10

INSTALLATION

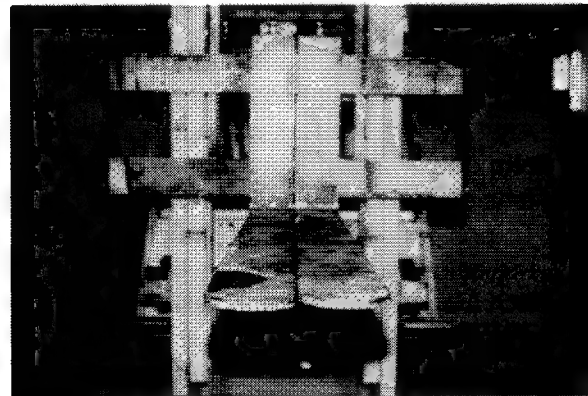
follow the removal procedure in the reverse order.

INSPECTION

1. Forks
 - (1) Bend, crack and unaligned tips
 - Fork bend limit: 15 mm (0.6 in.)
 - Fork tip alignment error limit: 10 mm (0.4 in.)

Caution:

When the unaligned tip exceeds the limit, check the bend of the single fork, play of the fork installed part and the distortion of the lift bracket finger bar.

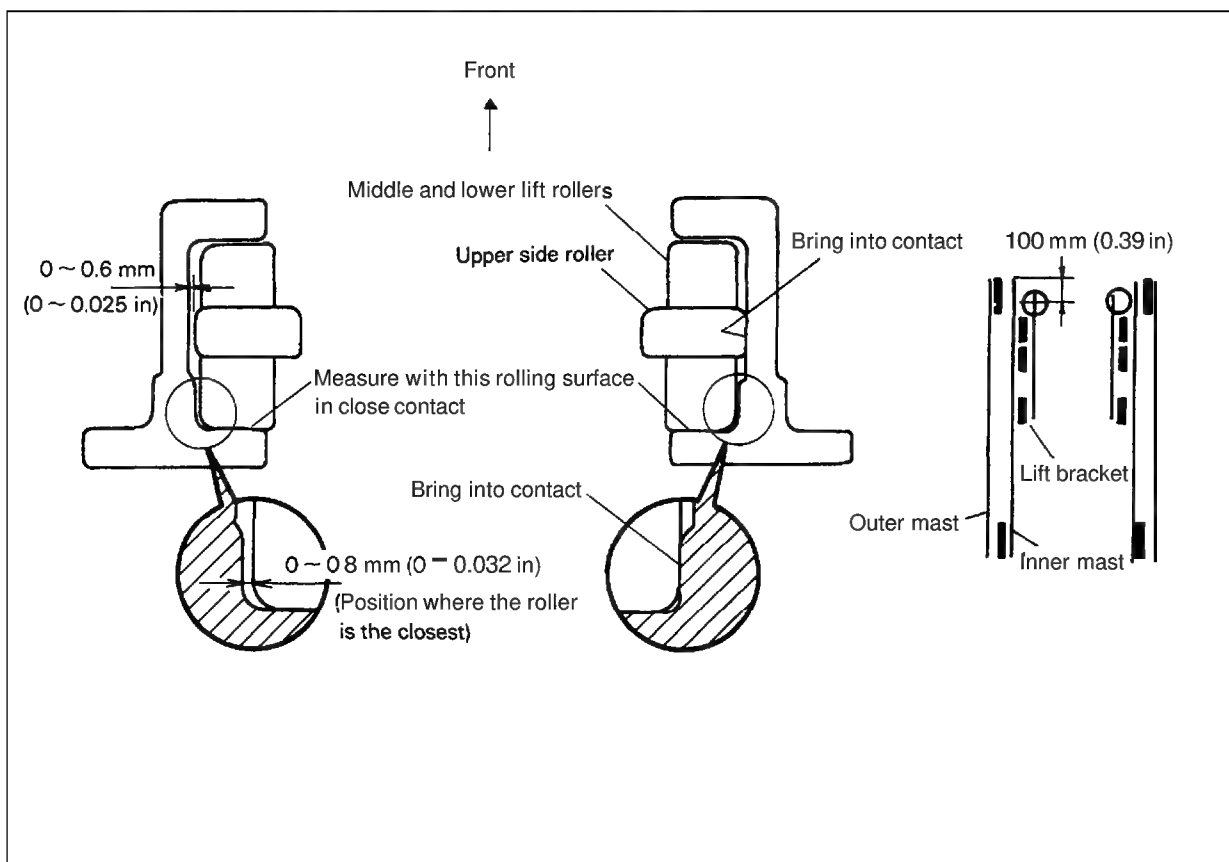


Inspecting the Fork

LAO114-9

MAST ADJUSTMENT

LIFT BRACKET LIFT ROLLER ADJUSTMENT

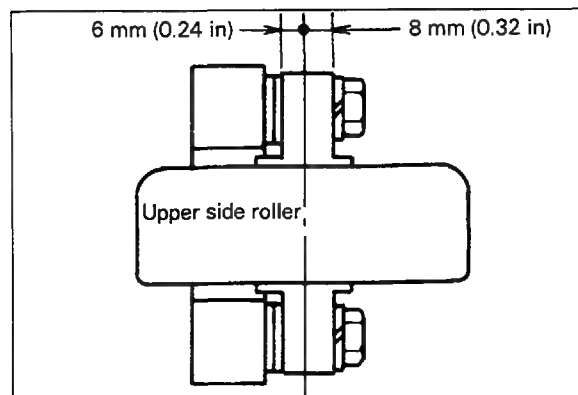


Gap Adjustment between the Lift Bracket Side Roller and the Inner Mast

LAOS385

1. Lift bracket roller adjustment

- (1) Make adjustment with the center of the upper side roller of the lift bracket placed at 100 mm (0.39 in) from the top end of the inner mast.
- (2) Upper lift rollers require no adjustment because they are fixed by snap rings.
- (3) For the center and lower lift rollers, shift the lift bracket to one side to bring the rollers into contact with the mast and adjust the clearance between the roller surface on the opposite side and the mast to 0 — 0.8 mm (0 — 0.032 in) at the position where the rollers are closest to the mast.
- (4) The upper side roller adjustment shall be made after adjusting the center and lower side rollers (in (3) above). Bring the side roller on one side into contact with the mast side surface, and adjust the clearance between the side roller and inner mast side surface on the opposite side to 0 — 0.6 mm (0 — 0.025 in).
- (5) After adjustments in (3) and (4) above, check that the lift bracket moves smoothly along the overall mast length.



Adjustment the Upper Side Roller

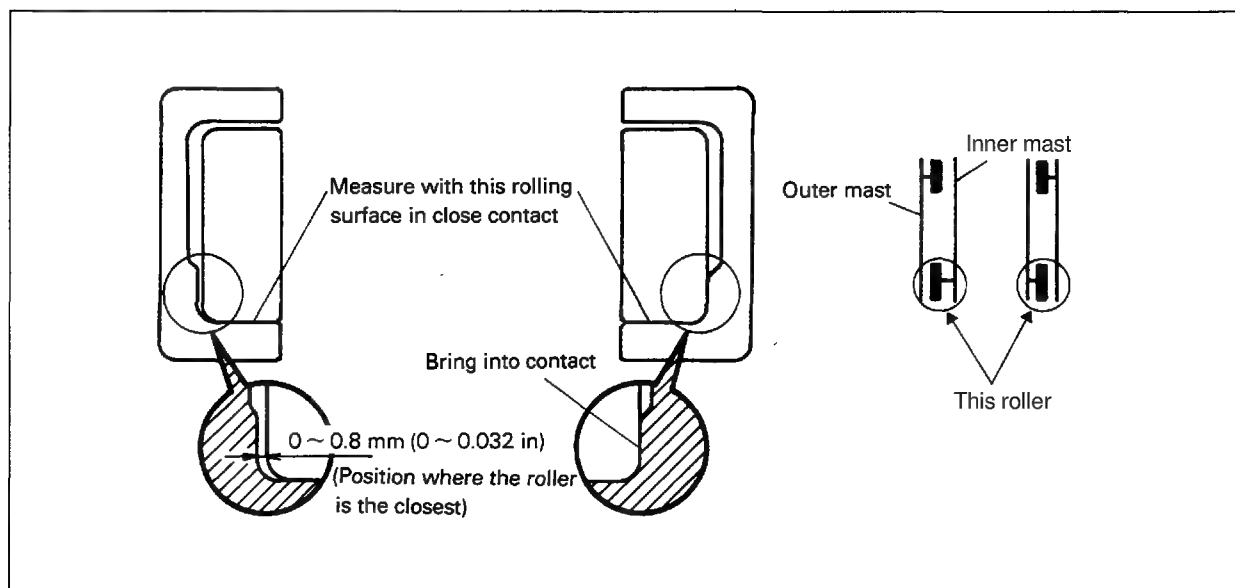
LAOS386

Table of the Lift Bracket Rollers

Vehicle model	No.	Outside diameter mm (in)	Seal color	Place used	Remarks
5FGC10~15	No. 1	93.3 (3.07)	Brick	Center only	—
	No. 2	94.5 (3.72)	Black	Upper and lower	—
	No. 3	95.0 (3.74)	Blue	Upper and lower	Oversize
	No. 4	95.6 (3.76)	Black	Upper and lower	Oversize for supply
	No. 5	65.0 (2.56)	Black	Upper side lower	—

MAST LIFT ROLLER ADJUSTMENT

Outer Mast and Inner Mast Roller



Gap Adjustment between the Outer Mast and the Inner Mast Roller

LAOS387

1. Outer mast and inner mast roller adjustment

- (1) Make adjustment with the mast overlap at near 450 mm (17.7 in).
- (2) Shift the inner mast to one side to bring the roller into contact with the mast, and adjust the clearance between the roller and mast on the opposite side at the closest position to 0 — 0.8 mm (0 — 0.032 in).
- (3) Roller selection
See the table of inner mast rollers.

Caution:

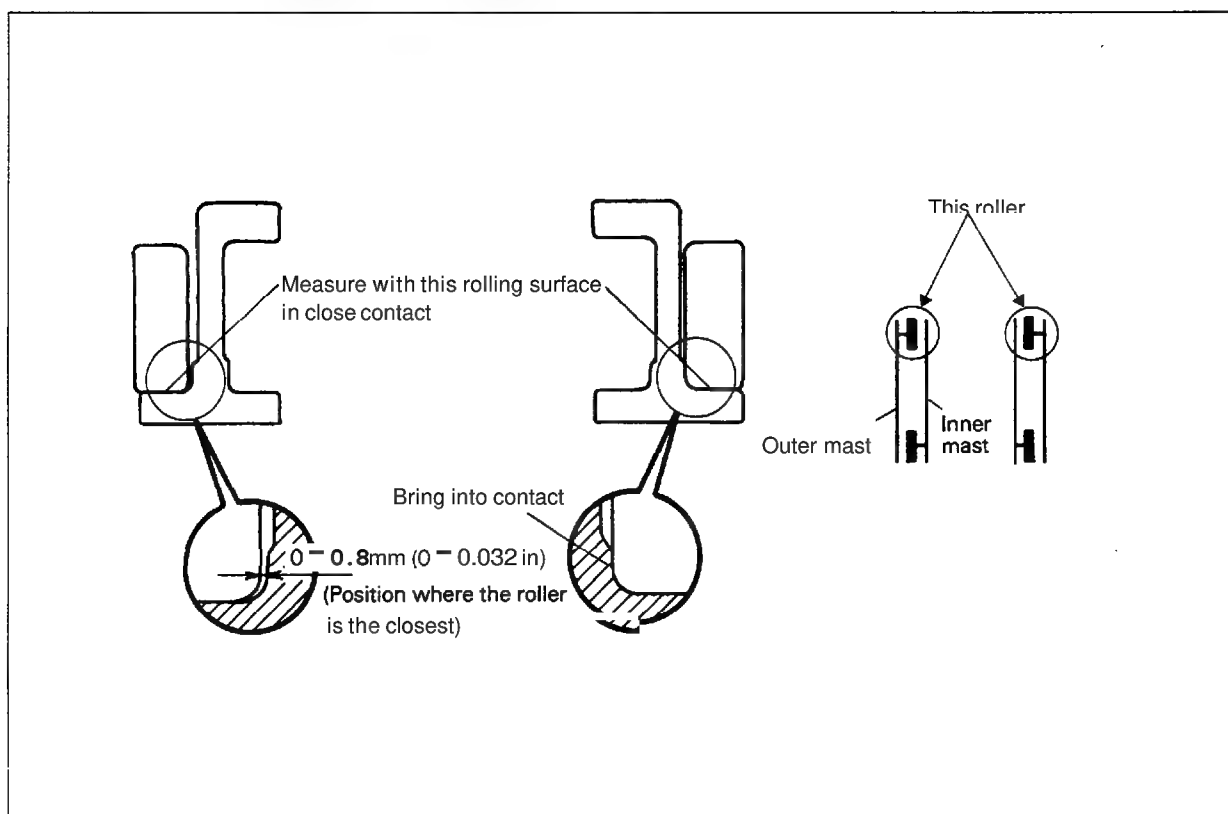
Use the oversize (No. 2) roller generally. Use No. 1 only when the mast inner width is narrow. The roller size may be different between the left and right sides.

- (4) After the adjustment, make sure that the inner masts move smoothly in the outer masts.

Table of the Lift Bracket Rollers

Vehicle model	No.	Outside diameter mm (in)	Outer mast inner width mm (in)	Seal color	Remarks
5FGC10~15	No. 1	114.5 (4.50)	115.1 (4.53)	Black	—
	No. 2	115.1 (4.53)		Blue	Oversize

OUTER MAST ROLLER AND INNER MAST



Gap Adjustment between the Inner Mast and the Outer Mast Roller

LAOS388

2. Outer mast roller and inner mast adjustment

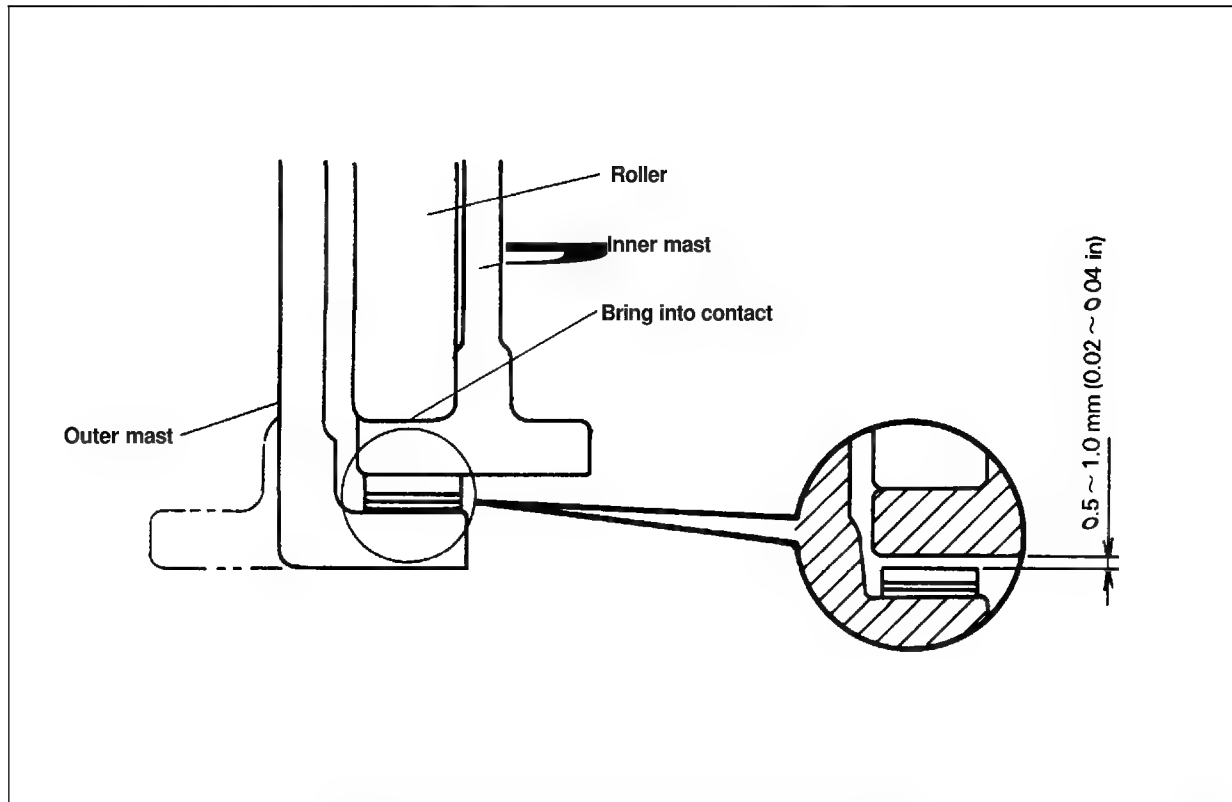
- (1) Make adjustment with the mast overlap at near 450 mm (17.7 in).
- (2) Shift the inner mast to one side to bring the roller into contact with the inner mast, and adjust the clearance between the roller and mast on the opposite side to 0 — 0.8 mm (0 — 0.032 in) where the roller is closest to the mast.
- (3) See the table below for the roller to be used.

Table of Outer Mast Rollers

Vehicle model	Outside diameter	Seal color
5FGC10~15	94.5 (3.72)	Black

- (4) After the adjustment, make sure that the inner masts move smoothly in outer masts.

MAST STRIP ADJUSTMENT



Gap Adjustment between the Mast Strip and the Inner Mast

LAOS390

1. Mat strip adjustment

- (1) Place the inner mast at the fully lowered position before making the adjustment.
- (2) Adjust the clearance between the mast strip and mast to 0.5 — 1.0 mm (0.02 — 0.04 in) with the inner mast in contact with the outer mast roller.
- (3) After the adjustment, make sure that the masts move smoothly.

LIFT CYLINDER ROD SHIM ADJUSTMENT (PREVENTION OF UNEVEN LIFTING)

Caution:

- For double lift cylinders, inspection and adjustment are required to prevent uneven lifting on the left and right sides due to tolerances of parts.
- The inspection and adjustment must be made whenever any one of the following parts is replaced:

(1) Lift cylinder ASSY	(4) Mast ASSY
(2) Lift cylinder rod ASSY	(5) Outer mast SUB-ASSY
(3) Lift cylinder SUB-ASSY	(6) Inner mast SUB-ASSY

Inspection method

Slowly raise the inner mast, and observe the stopping of the right and left cylinder rods the moment the inner mast reaches the maximum height.

(1) Normal case

Both the right and left rods stop almost simultaneously. with almost no shaking of the inner mast.

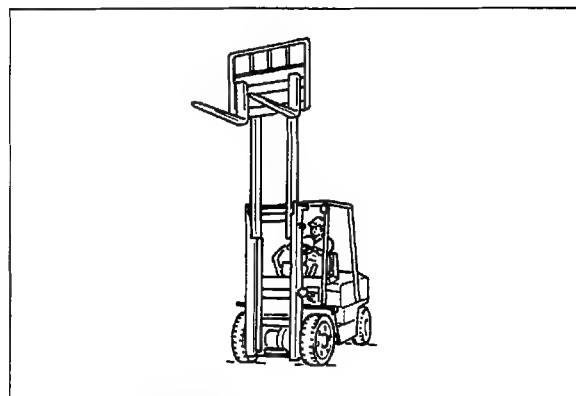
(2) Abnormal case

The rods stop with slight difference. and the top of the inner mast shakes the moment the later rod stops. To correct, add shims to the cylinder that stops first.

Adjustment method

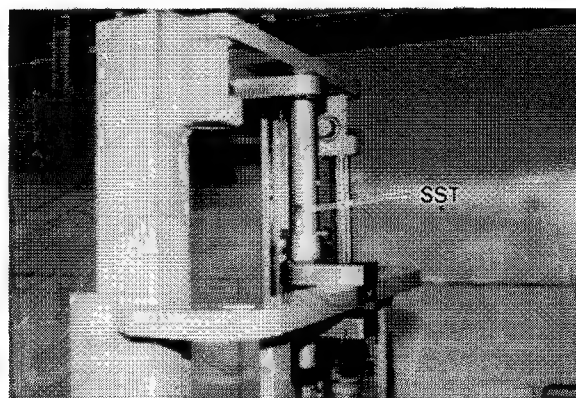
- (1)' Raise the inner mast. Set SST to the outer master tie-beam, and lower the inner mast until it reaches SST.
- SST 09610-22000-7 1
- (2) Remove the set bolt of the cylinder rod end on the side for shim adjustment.
- (3) Slowly lower the lift cylinder rod to disconnect the rod end.
- (4) Place the shims on the cylinder rod end. Slowly raise the lift cylinder rod into the inner mast.
- (5) Fix the set bolt of the cylinder rod end.
- (6) Raise the inner mast for reinspection.
- (7) Repeat the inspection and adjustment until the number of shims is decided.

Shim thickness: 0.5 mm and 1.0 mm
(0.02 in and 0.04 in)



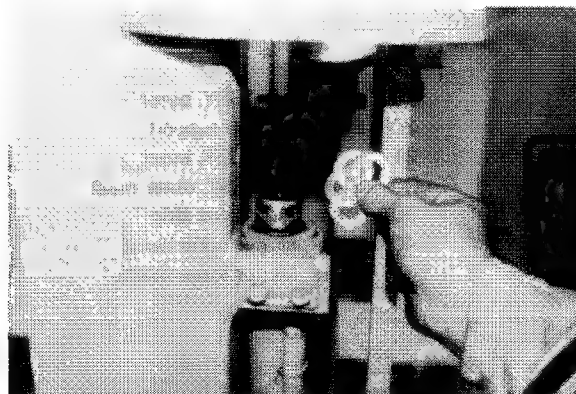
Inspecting Uneven Movements of Lift Cylinder

LAPS67



SST Set

LAR36-25

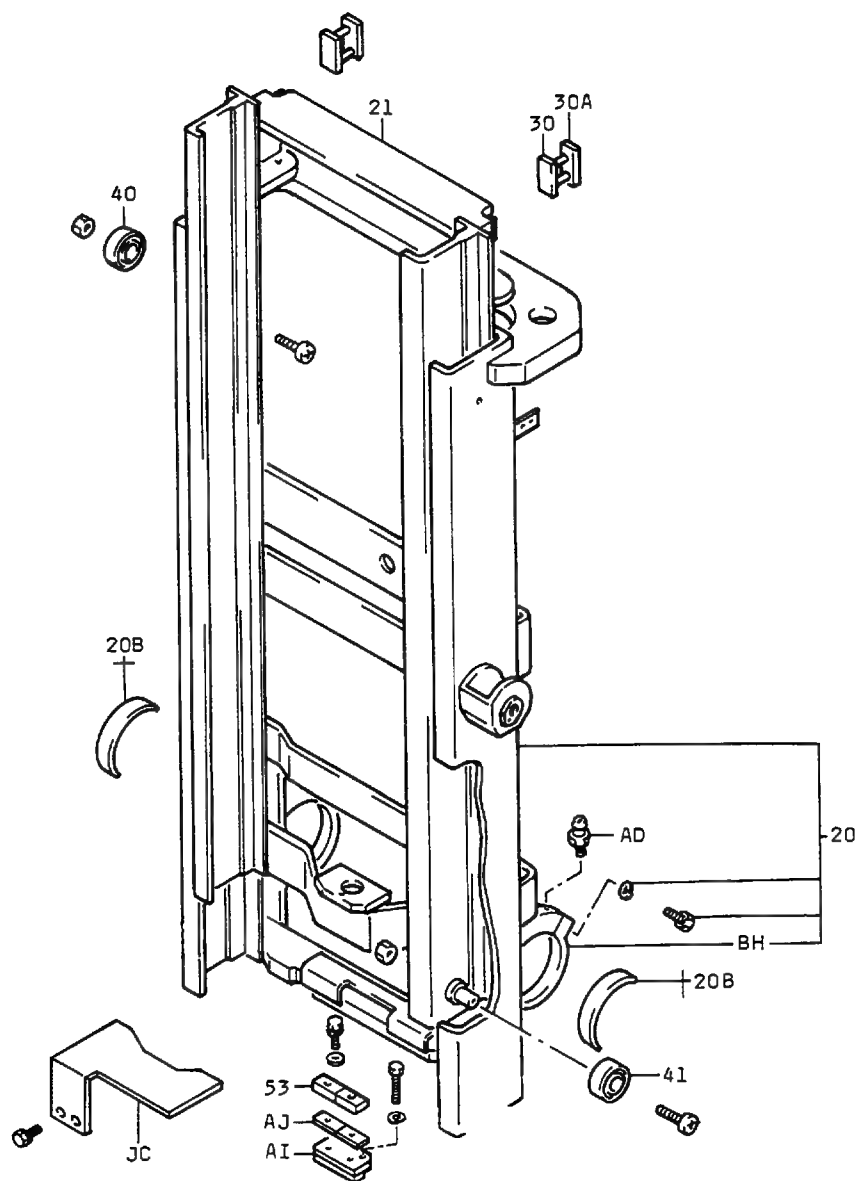


Shim Adjustment

LAR36-26

FV·FSV MAST ASSY

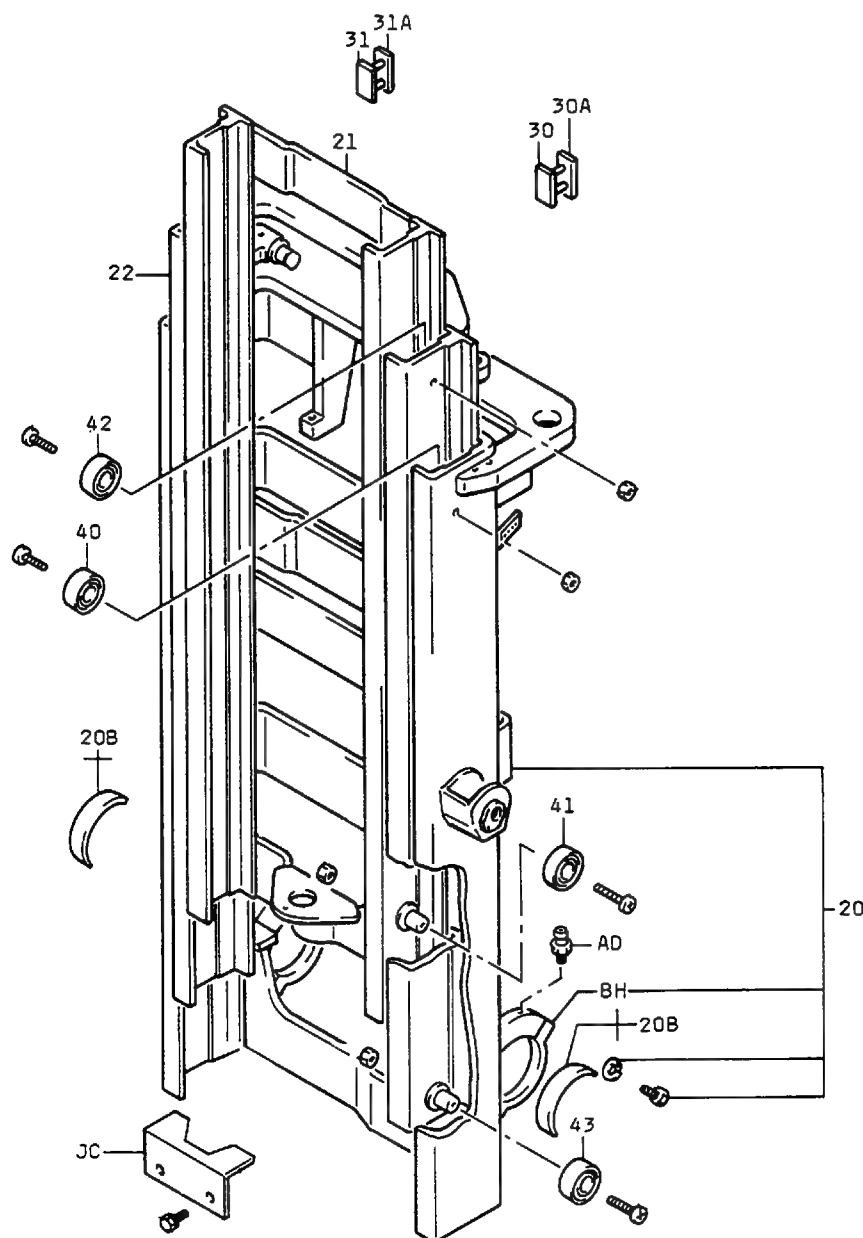
COMPONENTS



- | | | | |
|-----|-------------------------------|----|--------------------------------|
| 20 | Mast SUB-ASSY, outer | 53 | Cushion, mast (for inner mast) |
| 20B | Bushing, mast support | AD | Fitting, grease |
| 21 | Mast SUB-ASSY, inner | AI | Stopper |
| 30 | Strip SUB-ASSY, outer mast | AJ | Shim, stopper |
| 30A | Shim, outer mast strip | BH | Cap, mast support |
| 40 | Roller, lift (for outer mast) | JC | Guide, hose |
| 41 | Roller, lift (for inner mast) | | |

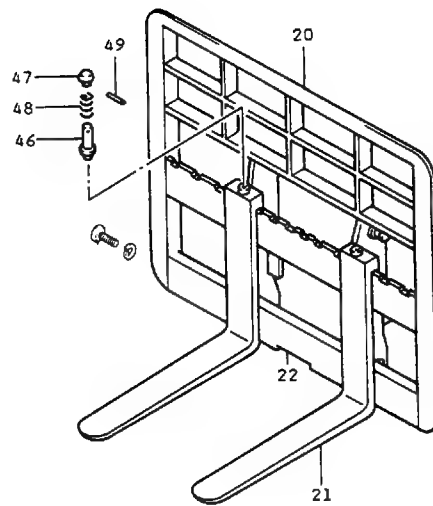
Mast Components (FV)

LARM27

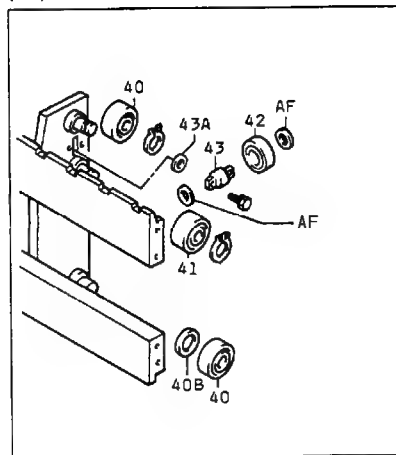


20 Mast SUB-ASSY, outer
 20B Bushing, mast support
 21 Mast SUB-ASSY, inner
 22 Mast SUB-ASSY, middle
 30 Strip SUB-ASSY, outer mast
 30A Shim, outer mast strip
 31 Strip SUB-ASSY, middle mast
 31A Shim, middle mast strip

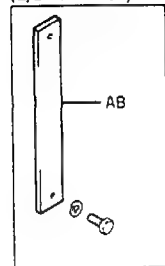
40 Roller, lift (for outer mast)
 41 Roller, lift (for inner mast)
 42 Roller, lift (for middle mast upper)
 43 Roller, lift (for middle mast lower)
 AD Fitting, grease
 BH Cap, mast support
 JC Guide, hose



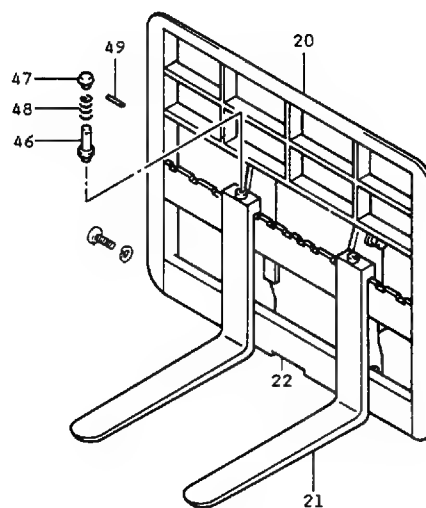
(FV)



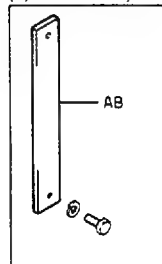
(L/BACK REST)



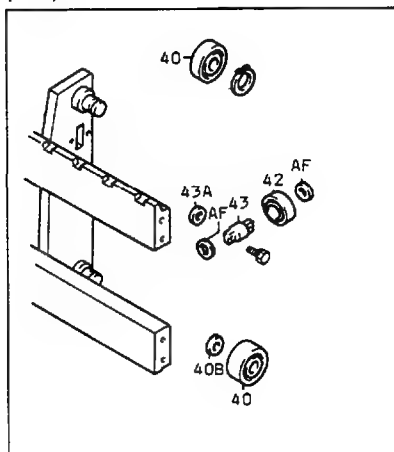
- | | | | |
|-----|-----------------------------|-----|------------------------------------|
| 20 | Backrest SUB-ASSY | 43A | Shim (for side roller shaft) |
| 21 | Fork SUB-ASSY | 46 | Pin, fork stopper |
| 22 | Bracket SUB-ASSY, lift | 47 | Knob, fork stopper pin |
| 40 | Roller, lift (upper, lower) | 48 | Spring, fork stopper pin |
| 40B | Shim, lift roller | 49 | Pin, spring (for fork stopper pin) |
| 41 | Roller, lift (center) | AB | Plate, side |
| 42 | Roller, side | AF | Plate |
| 43 | Shaft, side roller | | |



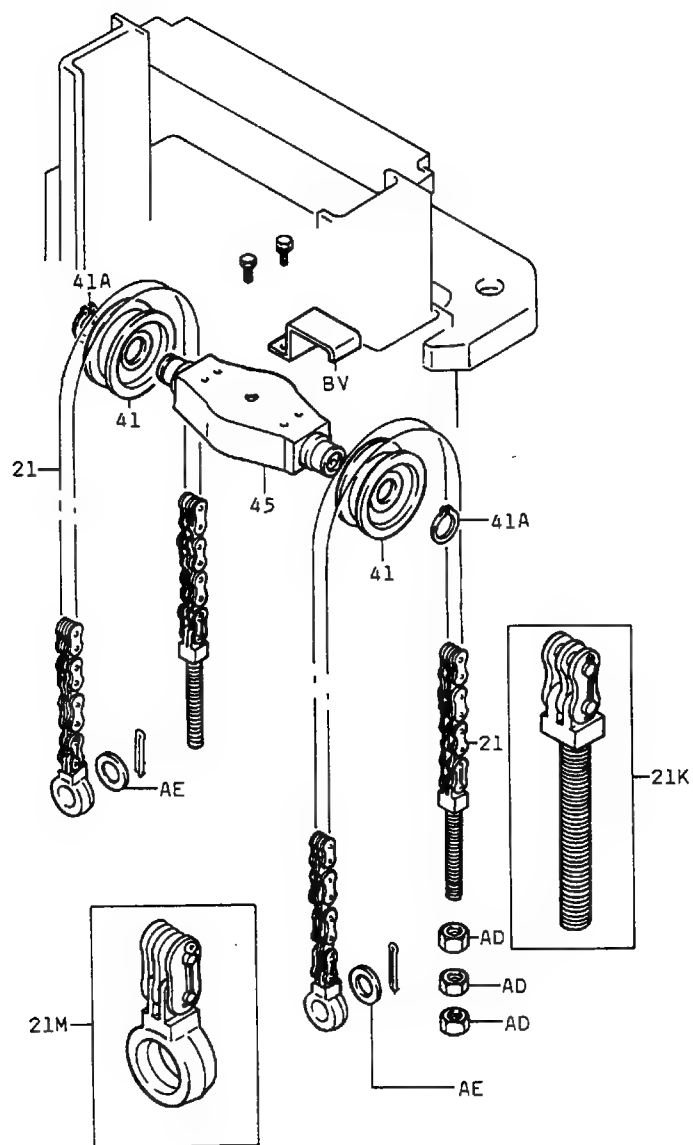
(L/BACK REST)



(FSV)



- | | | | |
|-----|-----------------------------|-----|------------------------------------|
| 20 | Backrest SUB-ASSY | 43A | Shim (for side roller shaft) |
| 21 | Fork SUB-ASSY | 46 | Pin, fork stopper |
| 22 | Bracket SUB-ASSY, lift | 47 | Knob, fork stopper pin |
| 40 | Roller, lift (upper, lower) | 48 | Spring, fork stopper pin |
| 40B | Shim, lift roller | 49 | Pin, spring (for fork stopper pin) |
| 42 | Roller, side | AB | Plate, side |
| 43 | Shaft, side roller | AF | Plate |

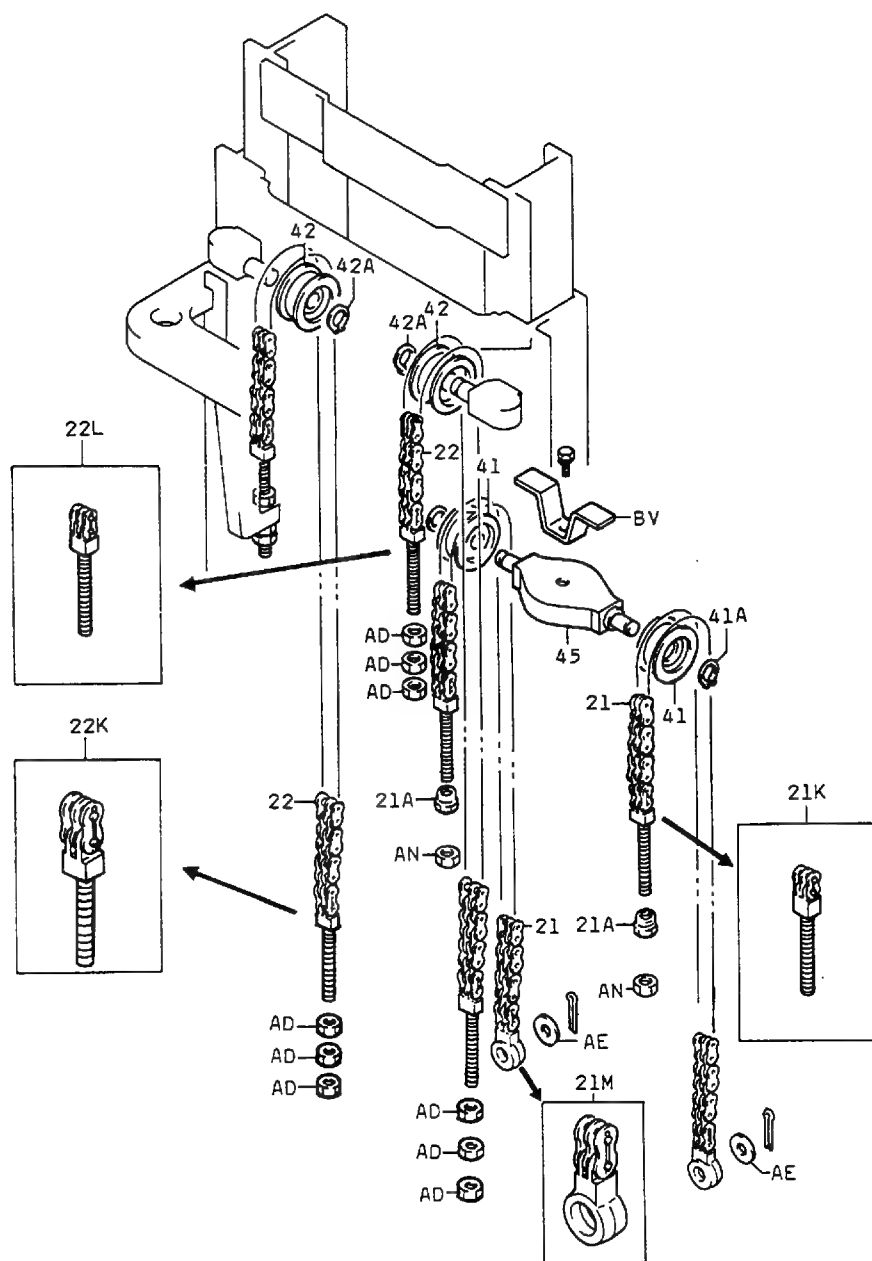


- 21 Chain SUB-ASY (front)
- 21K Bolt kit, chain anchor, No. 1 (front)
- 21M Bolt kit, chain eye (front)
- 41 Wheel, chain (front)
- 41A Ring, shaft snap (for front chain wheel)

- 45 Support, chain wheel
- AD Nut, hexagon
- AE Washer, chain special
- BV Stopper, chain

Chain Components (FV)

LARM31



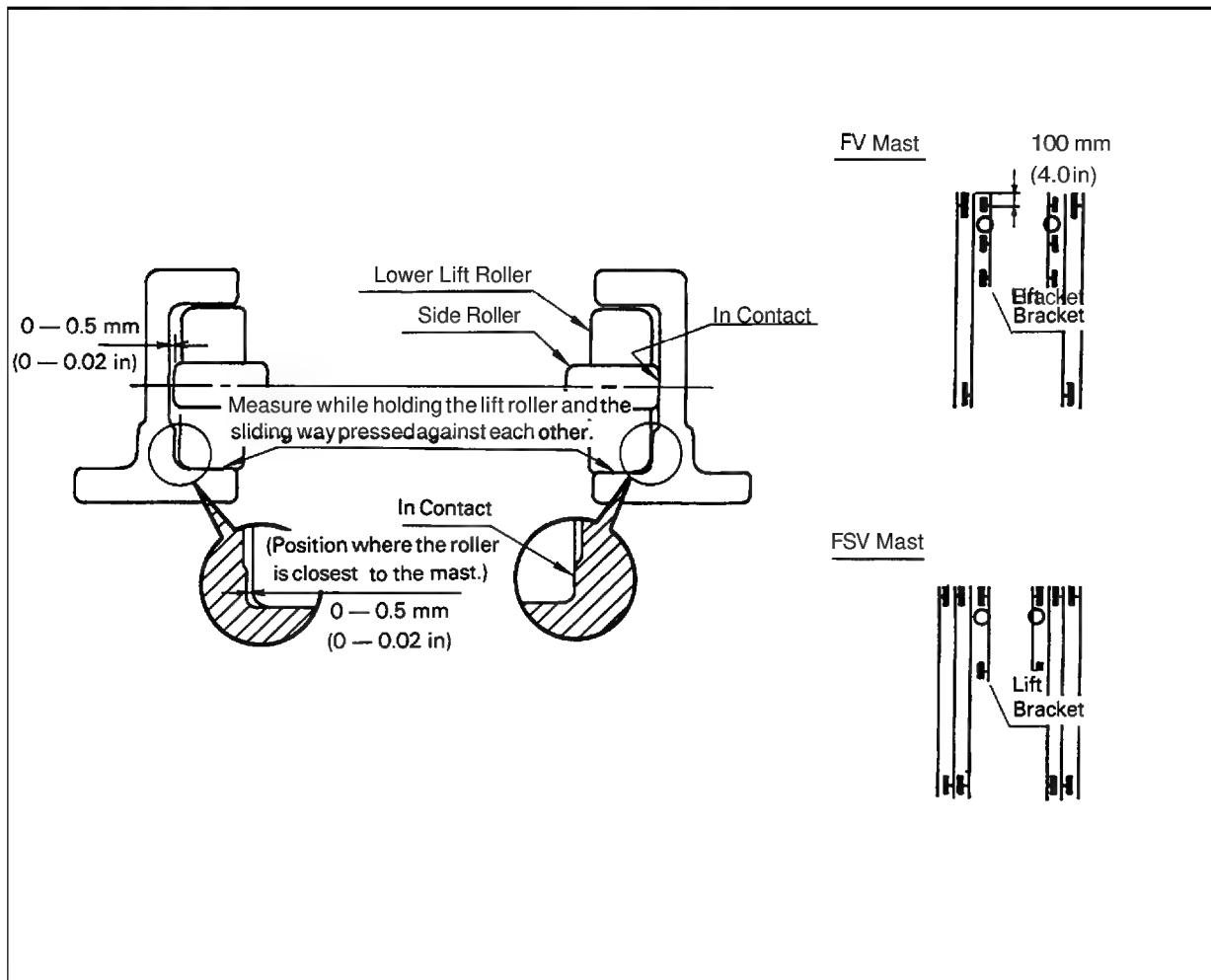
- 21 Chain SUB-ASSY (front)
- 21A Nut, chain adjust (front)
- 21K Bolt kit, chain anchor, No. 1 (front)
- 21M Bolt kit, chain eye (front)
- 22 chain SUB-ASSY (rear)
- 22K Bolt kit, chain anchor, No. 1 (rear)
- 22L Bolt kit, chain anchor, No. 2 (rear)
- 41 Wheel, chain (front)

- 41A Ring, shaft snap (for front chain wheel)
- 42 Wheel, chain (rear)
- 42A Ring, shaft snap (for chain wheel)
- 45 Support, chain wheel
- AD Nut, hexagon
- AE Washer, chain special
- AN Nut, hexagon
- BV Stopper, chain

MAST ADJUSTMENT (FV.FSV)

LIFT BRACKET LIFT ROLLER ADJUSTMENT

FV-FSV Mast



Gap Adjustment between the Lift Bracket Roller and the Inner Mast

LARS31

1. Lift bracket roller adjustment

- (1) Make adjustment with the lift bracket at the fully extended position (FSV) or with the center of the upper roller at 100 mm (4.0 in) from the top of the inner mast (FV).
- (2) The upper rollers (in FV and FSV) and center rollers (in V) require no adjustment because they are fixed by snap rings.
- (3) For lower lift rollers and side rollers, shift the lift bracket to one side to bring the rollers into contact with the mast, and adjust the clearance between the roller and mast on the opposite side to 0 — 0.5 mm (0 — 0.02 in) at the position where the rollers are closest to the mast.
- (4) Roller selection
See the table of lift bracket rollers.

Caution:

Generally use No. 2 (oversize) for the upper and lower rollers, and use No. 1 only when the mast inner width is narrow.

- (5) After the adjustment, make sure that the lift bracket moves smoothly along the inner mast.

Table of the Lift Bracket Roller (FSV)

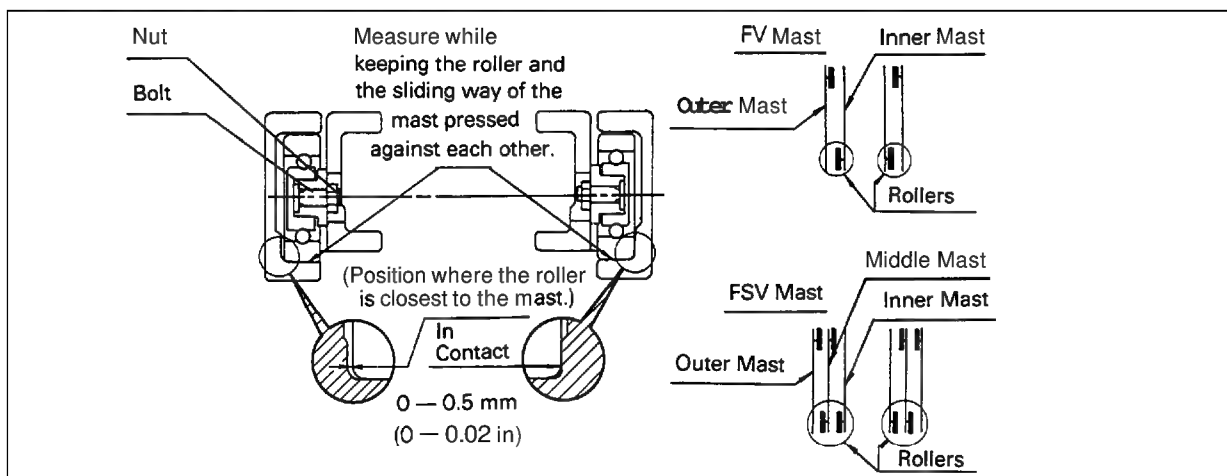
Vehicle model	No.	Outside diameter mm (in)	Seal color	Place used	Remarks
5FGC10 ~15	FV	No. 1	94.5 (3.72)	Black	Upper and lower
		No. 2	95.0 (3.74)	Blue	Upper and lower
		No. 3	93.3 (3.67)	Brick	Center only
		No. 4	62.0 (2.44)	—	Side roller
	FSV	No. 1	94.5 (3.72)	Black	Upper and lower
		No. 2	95.0 (3.74)	Blue	Upper and lower
		No. 3	62.0 (2.44)	—	Side roller

MAST LIFT ROLLER ADJUSTMENT

Outer Mast and Inner Mast Rollers (FV Mast)

Outer Mast and Middle Mast Lower Rollers (FSV Mast)

Middle Mast and Inner Mast Rollers (FSV Mast)



LARS32

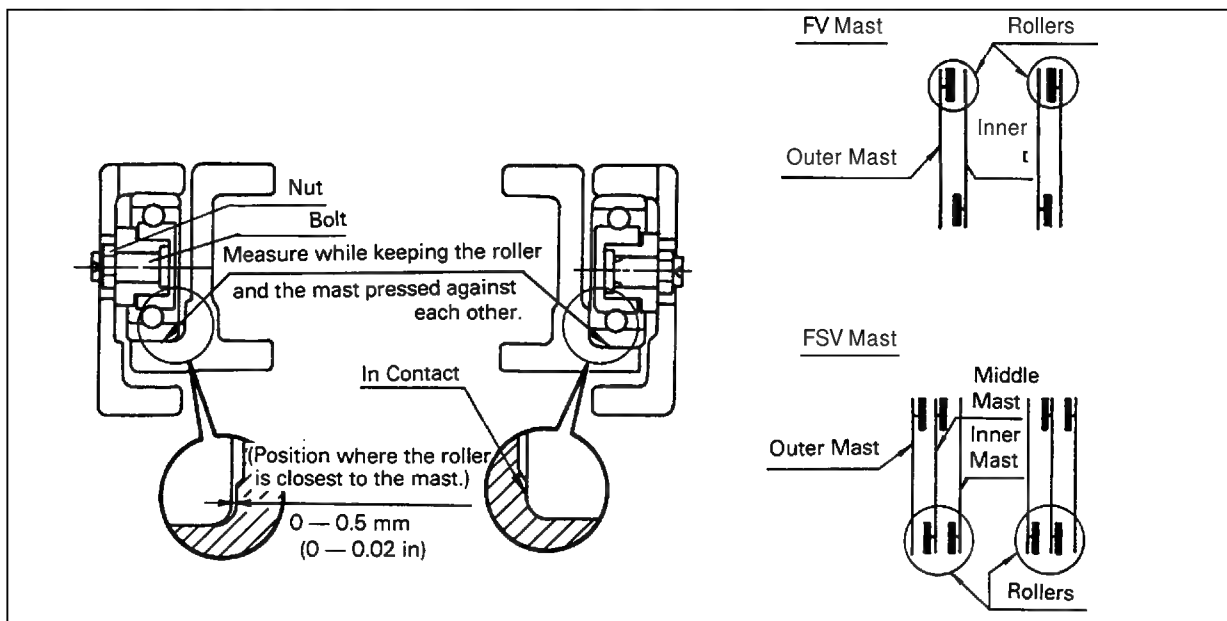
- Shift the inner mast (middle) mast to one side to bring the roller into contact with the mast, and adjust the clearance between the roller and mast on the opposite side to 0 — 0.51 mm (0 — 0.02 in) at the position where the roller is closest to the mast.
 - Turn the bolt for adjustment. When the proper clearance is obtained, lock the bolt by the nut. The mast clearance, however, shall be equal on the left and right sides.
 - Roller selection
See the table of inner mast and middle mast rollers.
- Caution:
Generally use oversize (No. 2) rollers. Use No. 1 only when the mast inner width is narrow.
- After the adjustment, make sure that the inner masts (middle masts) move smoothly in outer masts (middle masts).
 - See the table for mast overlapping amount for the mast overlapping at the time of adjustment.

Table of the Lift Bracket Roller (FSV)

Vehicle model		No.	Outside diameter mm (in)	Mast inner width mm (in)	Seal color	Remarks
5FGC10 ~15	FV inner, FSV middle lower	No. 1	114.5 (4.50)	115.0 (Outer) (4.53)	Black	—
		No. 2	115.1 (4.53)		Blue	Oversize
	FSV inner	No. 1	94.5 (3.72)	95.0 (Middle) (3.74)	Black	—
		No. 2	95.0 (3.74)		Blue	Oversize

Table of the Mast Overlapping Amount at Adjustment Time

N		FSV	
Maximum fork height mm (in)	Overlap amount mm (in)	Maximum fork height mm (in)	Overlap amount mm (in)
3500 (138.8) or less	400 (15.75)	5500 (216.6) or less	450 (17.7)
3700 (145.7)	500 (19.7)	6000 (236.2)	500 (19.7)
4000 (157.5) or more	600 (23.63)	6500 (255.9)	600 (23.63)

Outer Mast Rollers and Inner Mast (FV Mast)**Outer Mast Rollers and Middle Mast (FSV Mast)****Middle Mast Upper Rollers and Inner Mast (FSV Mast)**

LARS33

1. See the table of the mast overlapping amount at adjustment time for the mast overlapping at the time of adjustment.
2. Shift the inner mast (middle mast) to one side to bring the roller into contact with the mast, and adjust the clearance between the mast and roller on the opposite side to 0 — 0.5 mm (0 — 0.02 in) at the position where the roller is closest to the mast.
3. Turn the bolt for adjustment. When the proper clearance is obtained, lock the bolt by the nut. The clearance, however, shall be equal between the left and right sides.

4. Roller selection

See the table of the outer mast and middle mast upper section rollers.

5. After the adjustment, make sure that the middle masts (inner masts) move smoothly in outer masts (middle masts).

Table of the Mast Overlapping Amount at Adjustment Time

FV		FSV	
Maximum fork height mm (in)	Overlap amount mm (in)	Maximum fork height mm (in)	Overlap amount mm (in)
3500 (138.8) or less	400 (15.75)	5500 (216.6) or less	450 (17.7)
3700 (145.7)	500 (19.7)	6000 (236.2)	500 (19.7)
4000 (157.5) or more	600 (23.63)	6500 (255.9)	600 (23.63)

Table of the Outer Mast and Middle Mast Upper Section Roller

Vehicle model	Outside diameter mm (in)	Seal color
5FGC10~15 FV·FSV	94.5 (3.72)	Black

Caution:

- If the mast lift bracket does not move smoothly because of **overtightening** of the bolt at the time of bottom recessed roller adjustment by means of the bolt and nut, loosen the nut and bolt, and make readjustment after moving the mast or lift bracket a few times.
- Since the roller is not retracted by loosening of the bolt only, always move the mast or lift bracket a few times before making readjustment.

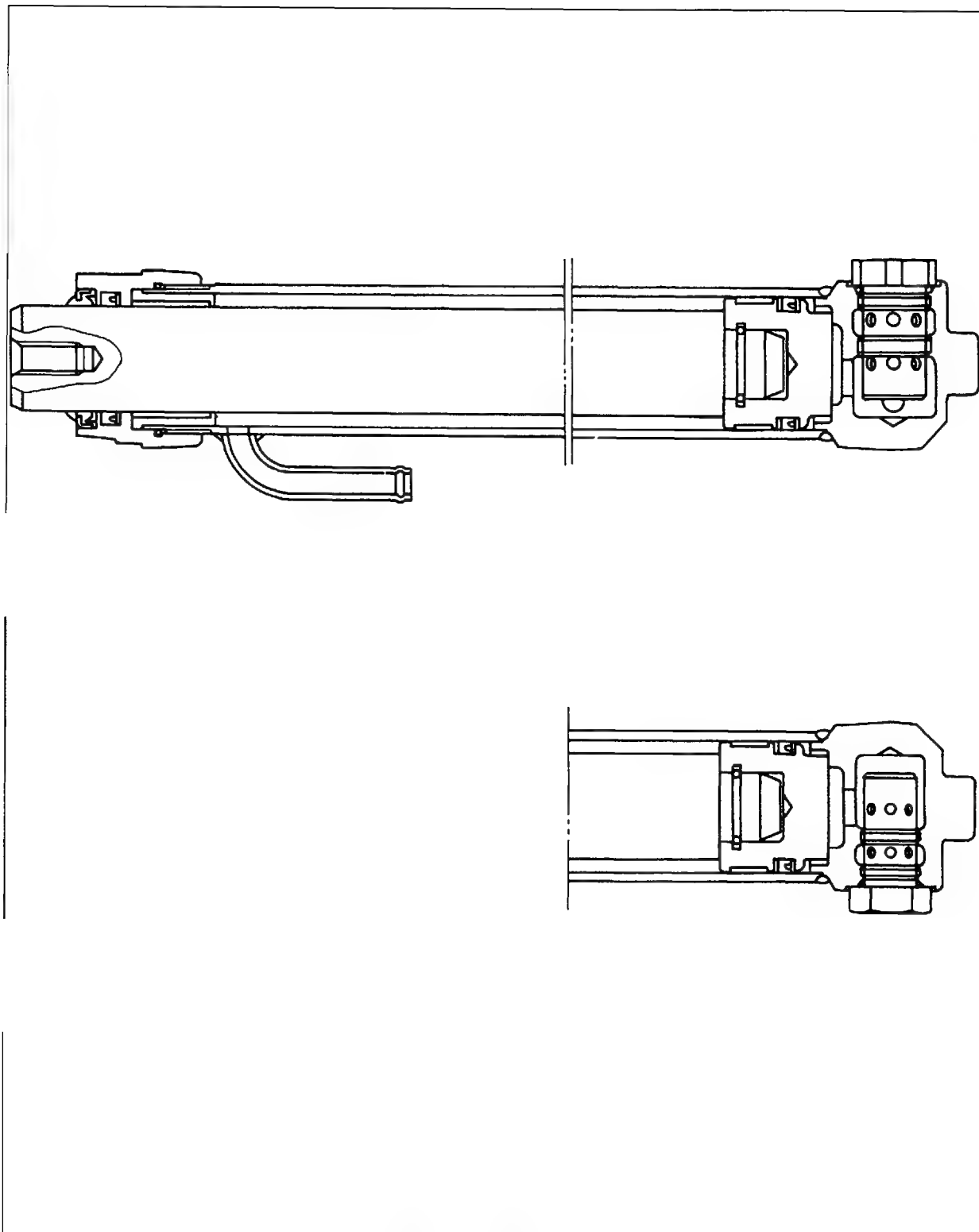
CYLINDERS

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LIFT CYLINDER (V) & REAR LIFT CYLINDERS (FSV.FV)

GENERAL

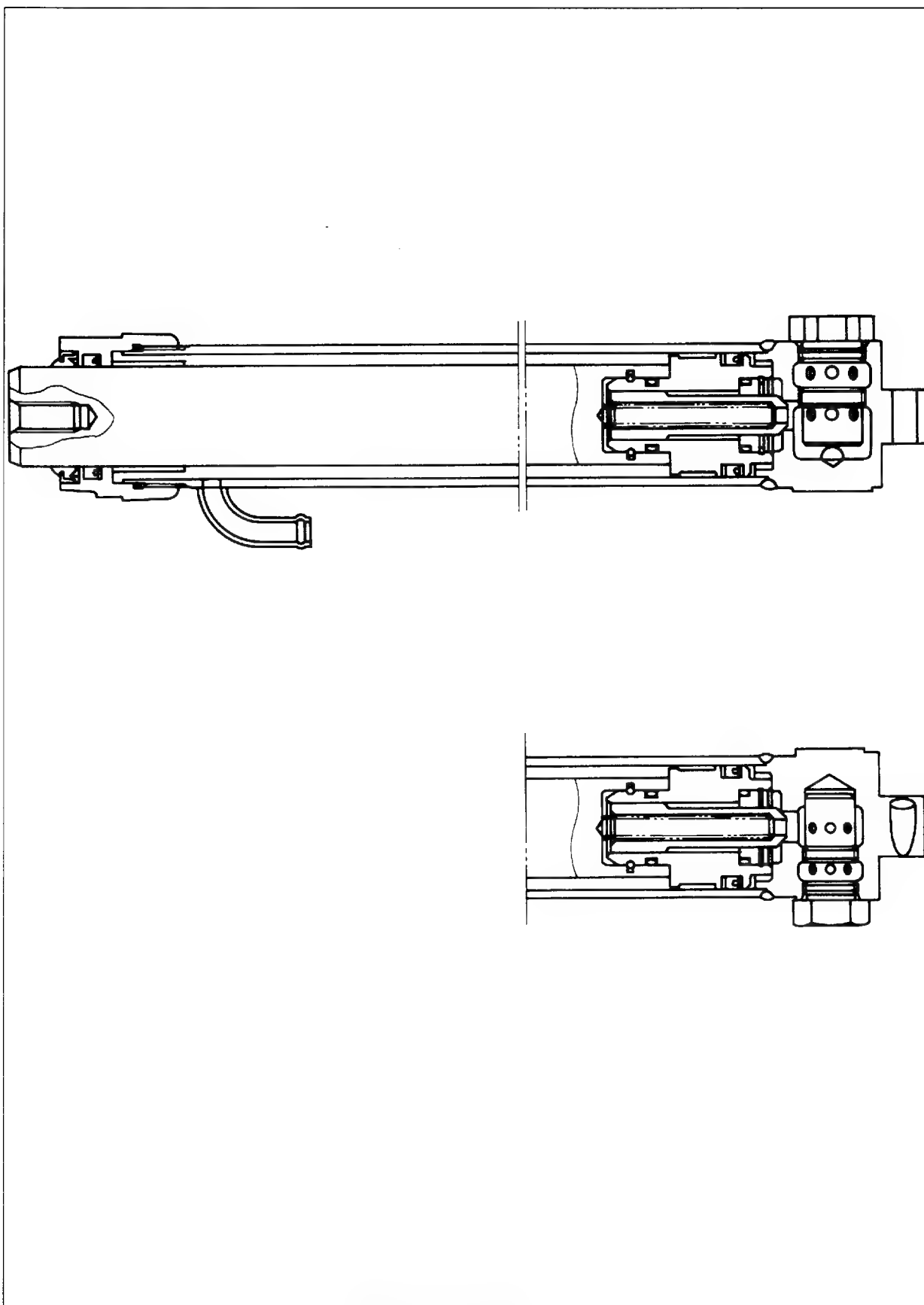
Lift Cylinder (V)



Lift Cylinder Sectional View

LAOM196

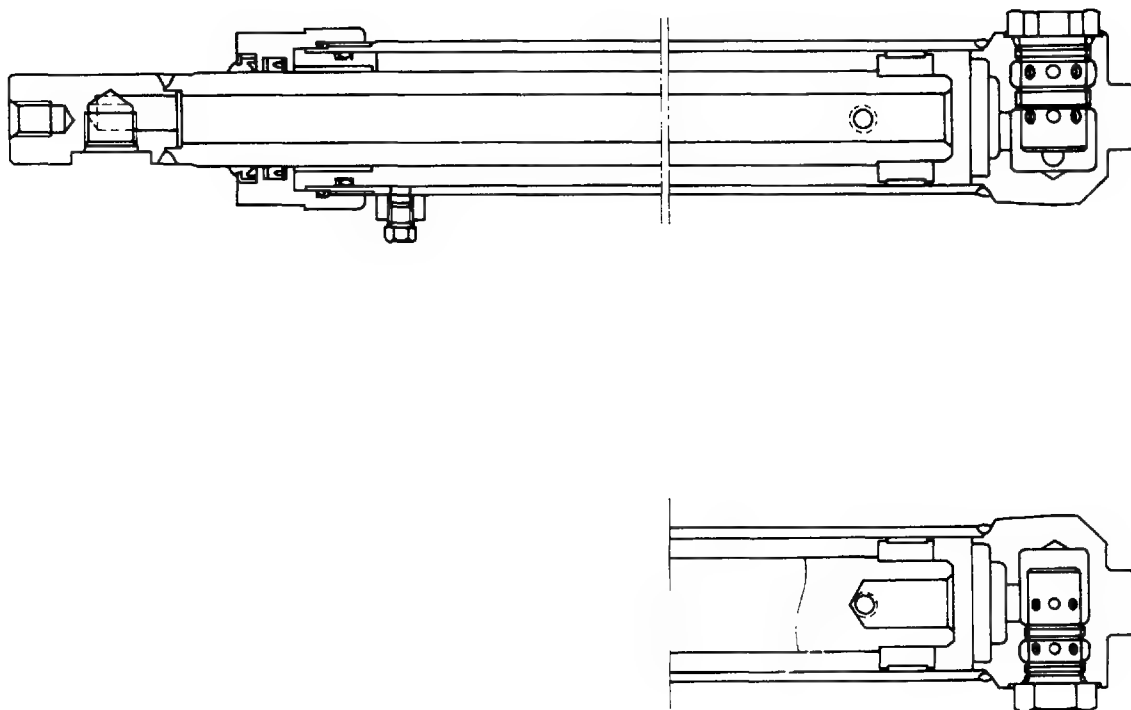
Rear Lift Cylinder (FSV)



Rear Lift Cylinder Sectional View

LAOM197

Rear Lift Cylinder (FV)

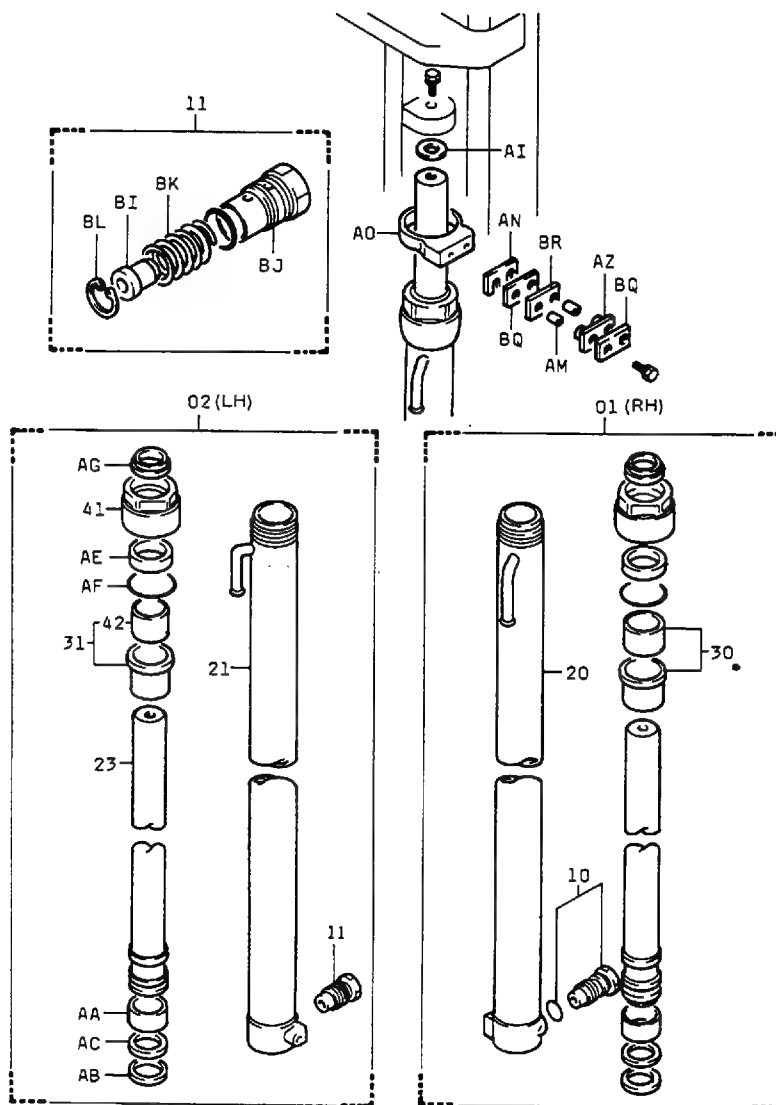


Rear Lift Cylinder Sectional View

LAOM198

COMPONENTS

Lift Cylinder (V)

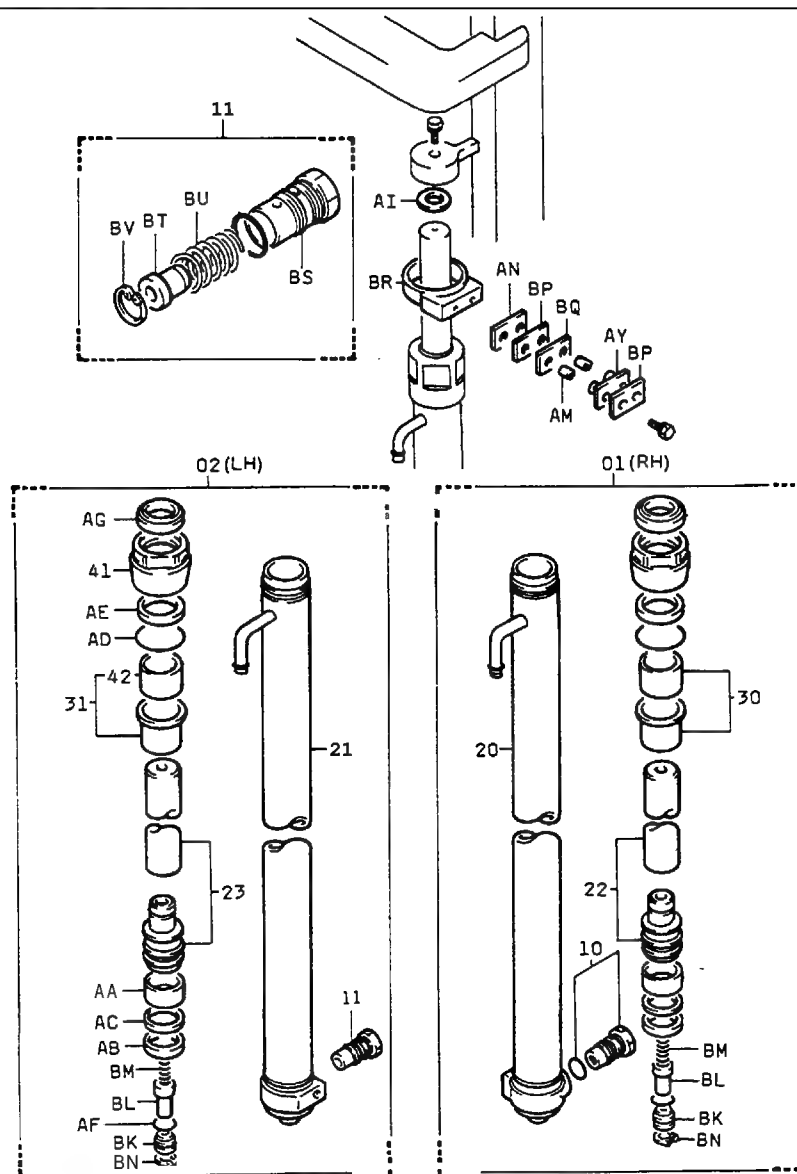


- | | | | |
|----|---------------------------------------|----|------------------------|
| 01 | Cylinder ASSY, lift, RH | AE | Packing, U |
| 02 | Cylinder ASSY, lift, LH | AF | Ring, O |
| 10 | Valve ASSY, flow regulator | AG | Seal, dust |
| 11 | Valve ASSY, safety down | AI | Shim |
| 20 | Cylinder SUB-ASSY, lift, RH | AM | Spacer |
| 21 | Cylinder SUB-ASSY, lift, LH | AN | Shim |
| 23 | Rod SUB-ASSY, lift cylinder, LH | AO | Support, lift cylinder |
| 30 | Guide SUB-ASSY, lift cylinder rod, RH | AZ | Rubber |
| 31 | Guide SUB-ASSY, lift cylinder rod, LH | BI | Piston |
| 41 | Cover, lift cylinder | BJ | Body |
| 42 | Sleeve, lift cylinder rod guide | BK | Spring |
| AA | Ring, wear | BL | Ring, snap |
| AB | Packing, U | BQ | Plate |
| AC | Ring, back up | BR | Rubber |

Lift Cylinder Components (V)

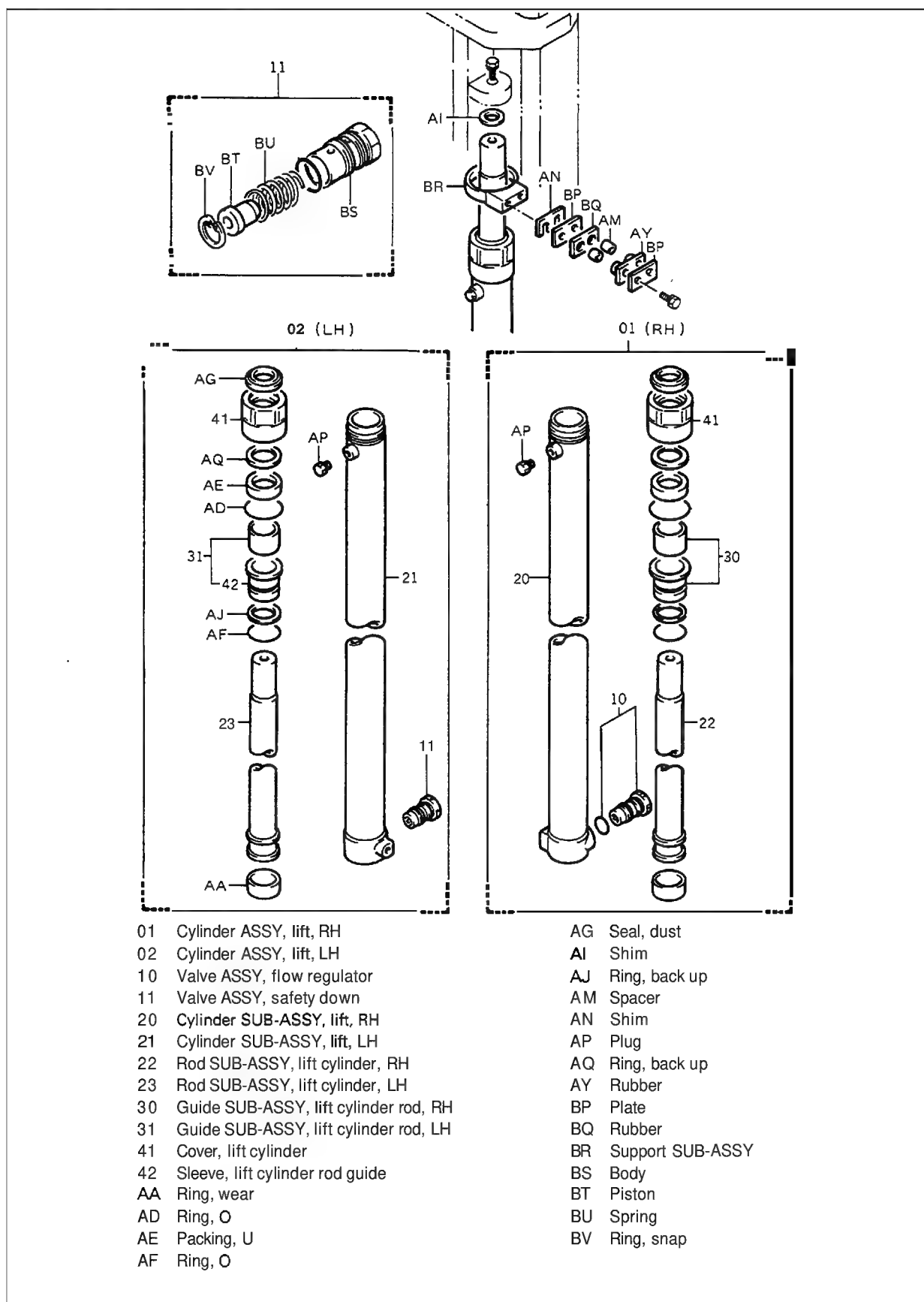
LARM64

Rear Lift Cylinder (FSV)



- | | | | |
|----|---------------------------------------|----|------------------|
| 01 | Cylinder ASSY, lift, RH | AF | Ring, O |
| 02 | Cylinder ASSY, lift, LH | AG | Seal, dust |
| 10 | Valve ASSY, flow regulator | AI | Shim |
| 11 | Valve ASSY, safety down | AM | Spacer |
| 20 | Cylinder SUB-ASSY, lift, RH | AN | Shim |
| 21 | Cylinder SUB-ASSY, lift, LH | AY | Rubber |
| 22 | Rod SUB-ASSY, lift cylinder, RH | BK | Collar |
| 23 | Rod SUB-ASSY, lift cylinder, LH | BL | Plunger, piston |
| 30 | Guide SUB-ASSY, lift cylinder rod, RH | BM | Spring |
| 31 | Guide SUB-ASSY, lift cylinder rod, LH | BN | Ring, snap |
| 41 | Cover, lift cylinder | BP | Plate |
| 42 | Sleeve, lift cylinder rod guide | BQ | Rubber |
| AA | Ring, wear | BR | Support SUB-ASSY |
| AB | Packing, U | BS | Body |
| AC | Ring, back up | BT | Piston |
| AD | Ring, O | BU | Spring |
| AE | Packing, U | BV | Ring, snap |

Rear Lift Cylinder (FV)



Rear Lift Cylinder Components (FV)

LARM65

SPECIFICATIONS

Lift Cylinder (V)

Lift cylinder type	Single-acting hydraulic system
Lift cylinder inside diameter	45 mm (1.77 in.)
Cylinder rod outside diameter	35 mm (1.378 in.)
Piston seal type	U-packing
Rod seal type	U-packing
Others	With flow regulator valve (RH) With safety down valve (LH)

Rear Lift Cylinder (FSV)

Lift cylinder type	Single-acting hydraulic system
Lift cylinder inside diameter	45 mm (1.77 in.)
Cylinder rod outside diameter	35 mm (1.378 in.)
Piston seal type	U-packing
Rod seal type	U-packing
Others	With flow regulator valve (RH) With safety down valve (LH)

Rear Lift Cylinder (FV)

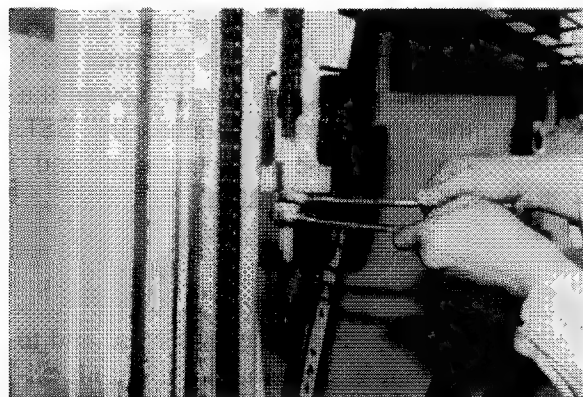
Lift cylinder type	Single-acting hydraulic system
Lift cylinder inside diameter	50 mm (2.0 in.)
Cylinder rod outside diameter	35 mm (1.38 in.)
Rod seal type	U-packing
Others	With flow regulator valve (RH) With safety down valve (LH)

REMOVAL

Note:

- The lift cylinder (V) and rear lift cylinder (FSV.FV) removal and installation procedures on the vehicle and after mast ASSY removal from the vehicle are almost the same.
- Whether to remove the mast ASSY from the vehicle or to remove only one side or both sides must be determined properly after checking the type and degree of the defect or trouble.

- 1 Disconnect the chain.
 - (1) Move the lift bracket to the lowest position, and slacken the chain.
 - (2) Remove the chain adjust nut and lock nut.



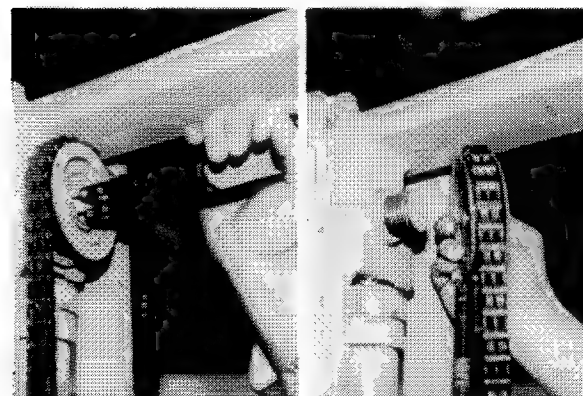
Disconnecting the Chain

LAR36-13

2. Remove the chain wheel.
 - (1) Use snap ring pliers to remove the snap ring.
 - (2) Remove the chain wheel.

Note:

If the fitting is hard to be removed, use.
SST 09950-20017



Removing the Chain Wheel

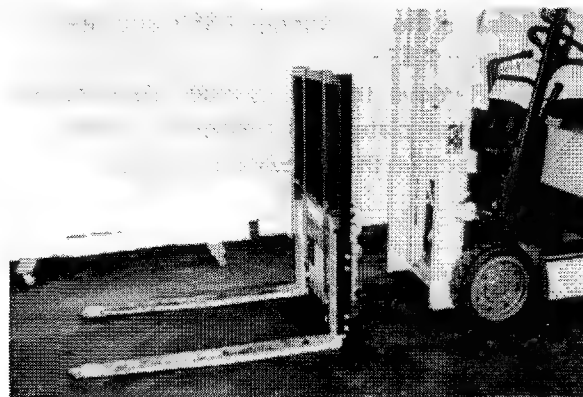
LAR36-15,17

3. Remove the lift bracket.
 - (1) Set the mast vertically, and raise the mast until the inner mast comes off from the lift bracket.

Caution:

When lifting the inner mast, carefully prevent the slackened chain from obstructing the inner mast movement.

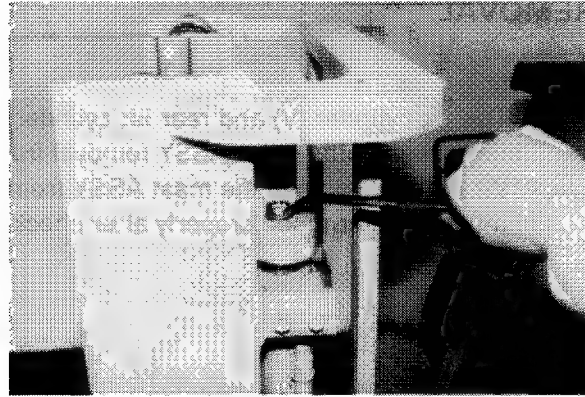
- (2) Slowly move the vehicle in the reverse direction.



Removing the Lift Bracket

LAR36-19

4. Disconnect the cylinder rod end.
 - (1) Remove the set bolt.



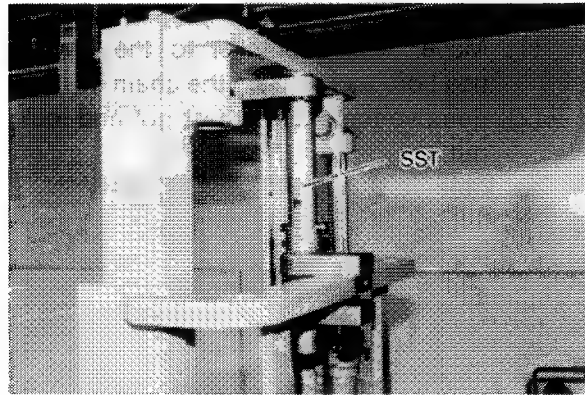
Disconnecting the Set Bolt

LAR36-21

- (2) Put the wire on the inner mast (middle mast), and set a hoist to the inner mast (middle mast) tie-beam. Lower the inner mast until it reaches the SST. Then disconnect the cylinder rod end. SST 09610-22000-71
 - (3) Shim

Caution:

Shims are used at the cylinder rod end to prevent uneven movement of right lift cylinder. Note the number of shims used and at which cylinder the adjustment is made.



Disconnecting the Cylinder Rod End

LAR36-25

Disconnect the hose.

- (1) Disconnect the high-pressure hose.

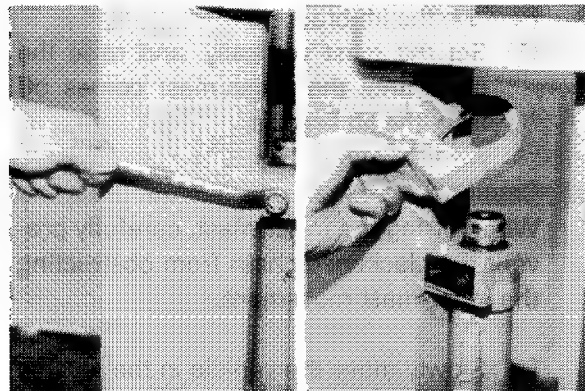


Disconnecting the Hose

LAR36-30

Remove the lift cylinder ASSY and rear lift cylinder ASSY.

- (1) Remove the lift cylinder support set bolts, plate, pipe, rubber and shims.
- (2) Remove the lift cylinder bracket.



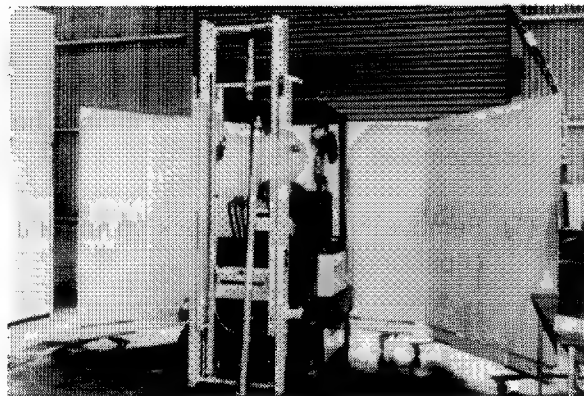
Removing the Cylinder Support

LAR36-34,36

- (3) Use a hoist and remove the lift cylinder ASSY, and the rear lift cylinder ASSY.

Caution:

- When hoisting the lift cylinder **ASSY** and the rear cylinder **ASSY**, try safe operation.
- Remove the lift cylinder not to damage the elbow at the cylinder bottom fittings.
- Lay the removed cylinder down securely on blocks.



Removing the Lift Cylinder ASSY

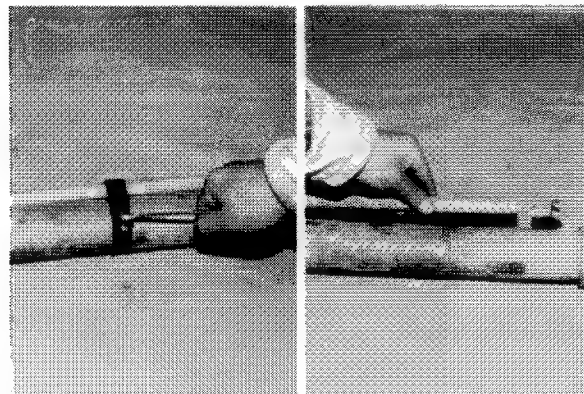
LAR36-38

DISASSEMBLY

1. Remove the overflow hose.
 - (1) Remove the hose clamp, and then the overflow hose.

Note:

There is no overflow hose for the FV mast because the cylinder system is different.



Removing the Hose

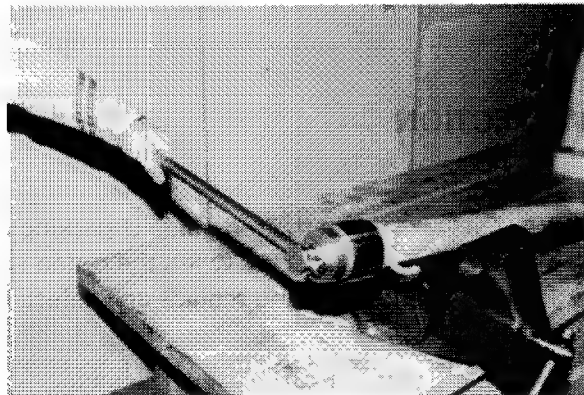
LA089-36,90-5

Remove the cylinder top cover.

Note:

Use a wrench or pipe wrench when removing the top cover.

Rod guide width: **50 mm (2.0 in.)**



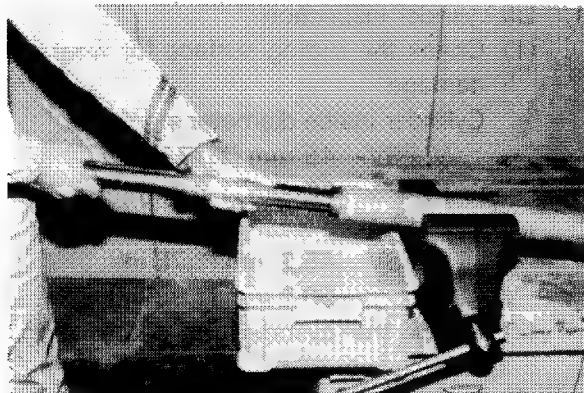
Removing the Cylinder Rod Guide

LAOW-6

Extract the lift cylinder rod.

Caution:

- Be careful not to damage the rod shaft plated surface.
- Be sure to draw out the cylinder rod straight.



Extracting the Lift Cylinder Rod

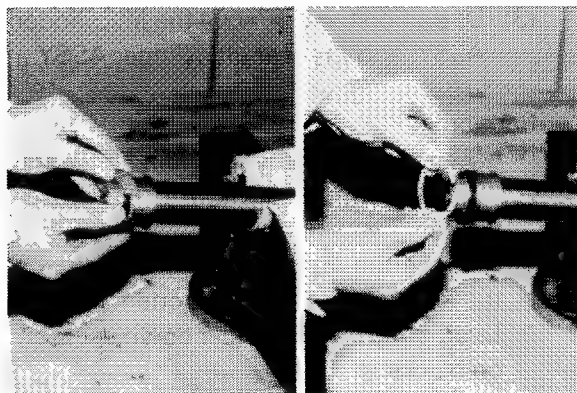
LA090-18

Remove the piston.

Caution:

The piston and the piston rod cannot be disassembled.

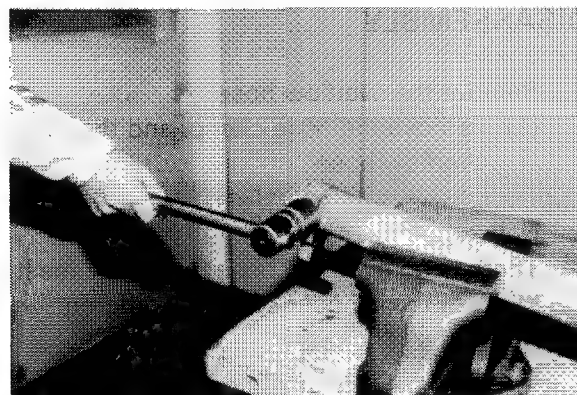
- (1) Remove the wear ring, back-up ring and U-packing.



Removing the Rings and U-packing

LA090-21,22

Remove the flow regulator valve, safety down valve.



Removing the Flow Regulator Valve

LA090-14

INSPECTION

Caution:

- Oil leaks when the rod guide U-packing or dust seal is defective.
- Hydraulic drift occurs when the piston U-packing is defective.
- Wash each part and replace any defective or damaged part.

Lift cylinder inspection

- (1) Check the sliding surface for wear or damage.

Cylinder inside diameter standard:

V, FSV 45 mm (1.77 in)

FV 50 mm (1.97 in)

Cylinder bore wear limit:

V, FSV 45.2 mm (1.78 in)

FV 50.2 mm (1.98 in.)

- (2) Check the cylinder for deformation, scratches or rust.
- (3) check the cylinder outer surface for local dents.



Inspecting the Lift Cylinder

LA090-30

2. Piston rod inspection

- (1) Check the piston rod sliding surface for damage or wear.

Piston rod outside diameter standard:

V, FSV 35.0 mm (1.378 in.)

FV 35.0 mm (1.378 in.)

Piston rod wear limit:

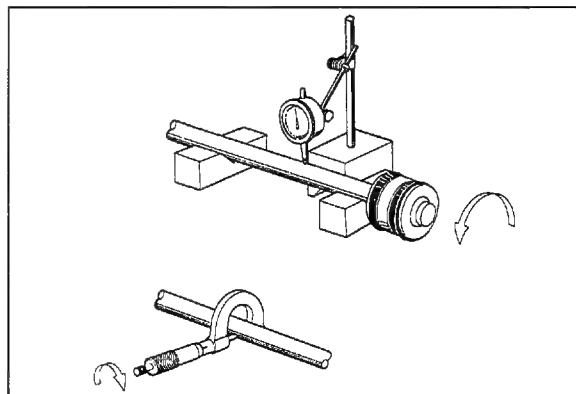
V, FSV 34.92 mm (1.377 in.)

FV 34.92 mm (1.377 in.)

- (2) Check the plated surface for exfoliation, scratches or rust.

- (3) Check the rod for bending.

Rod bending limit: 2.0 mm (0.08 in.)



Inspecting the Piston Rod

LAOM225

3. Rod guide inspection

- (1) Check the rod guide for damage.
- (2) Check the cylinder cover for damage.

4. Piston inspection

- (1) Check the piston for damage.
- (2) Check the wear ring for wear or damage.
- (3) Check the back-up ring for damage.
(V, FSV)
- (4) Check the stop ring for damage.
(V, FSV)

ASSEMBLY

The assembly procedure is the reverse of the disassembly procedure.

Caution:

- Do not assemble dry parts. Always coat hydraulic fluid before assembly.
- Use new O-rings, U-packings and dust seals at the time of reassembly.
- Apply a liquid packing (Three bond 1344 blue or equivalent, Part No. 08833-00080) to the threaded section of the cylinder cover, then tighten.
- The tightening torque of the cylinder cover: $T = 35 - 45 \text{ kg-m}$.

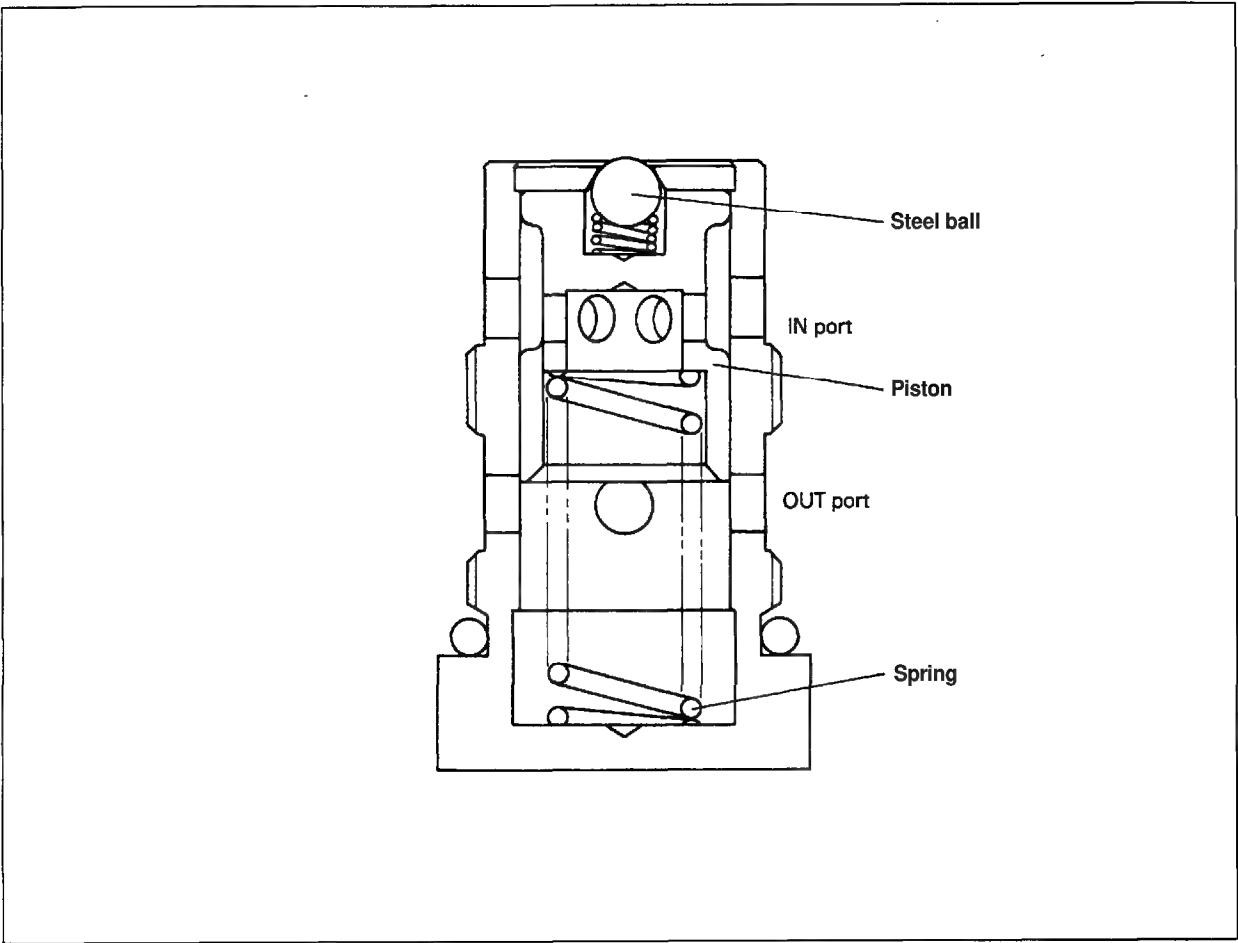
INSTALLATION

The installation procedure is the reverse of removal procedure.

Caution:

- Adjust the lift chain tension equally on the left and right sides.
- With no load, bleed the air by raising and lower the mast to full stroke ends and also check if the operation is proper.
- After checking the operation, check the hydraulic oil level with the level gauge. If insufficient, add (ISO VG32) hydraulic oil.
- Check to see if the maximum lifting height is as specified.
- When any of the lift cylinder ASSY, lift cylinder SUB-ASSY, or lift cylinder rod SUB-ASSY is replaced, adjustment and inspection are necessary. For the inspection and adjustment methods, see the lift cylinder rod shim adjustment.

FLOW REGULATOR VALVE (V.FSV.FV)



Flow Regulator Valve Sectional View

LAOS173

LOWERING SPEED SPECIFICATION

Unit: mm/sec. (fpm)

Vehicle Model \ Mast		V	FSV	FV
1 ton series	No load	550 (107)	440 (86)	350 (68)
	Loaded	500 (98)	470 (92)	400 (78)

REMOVAL

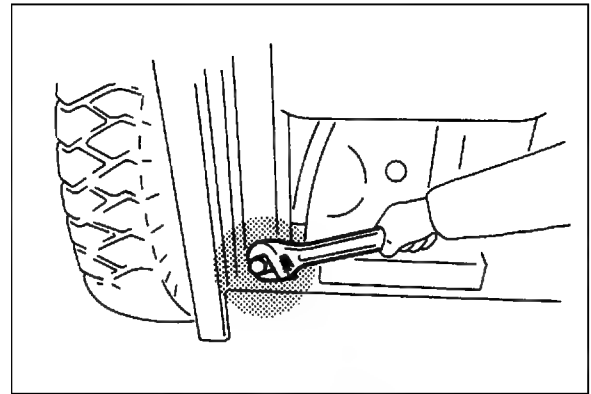
Caution:

- The flow regulator valve can be removed on the vehicle.
- Before removal, measure the lowering speed for quality judgement.
- The flow regulator valve is set to the lift cylinder RH.

1. Put the wire on the inner mast (middle mast), and set the hoist to the inner mast (middle mast) tie-beam. Lower the inner mast until it reaches the SST. Then disconnect the cylinder rod end.

SST 09610-22000-71

2. Remove the flow regulator valve.

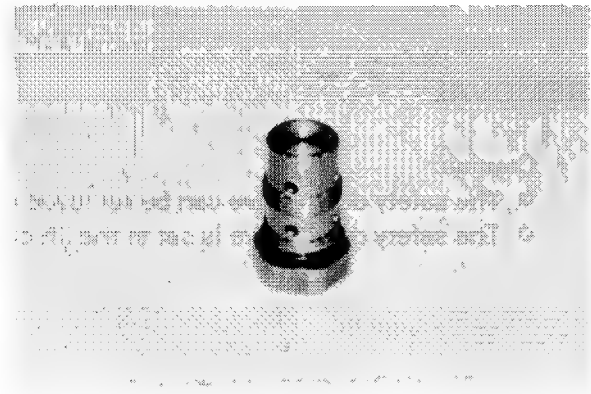


Removing the Flow Regulator Valve

LA0S442

INSPECTION

1. Check the top cover for slippage or damage.
2. Check the check ball movement and clogging of the check hole.
3. Check the piston movement.
4. Check the return spring for breakage.
5. Check the O-ring for wear or damage.



Inspecting the Flow Regulator Valve

LA090-16

INSTALLATION

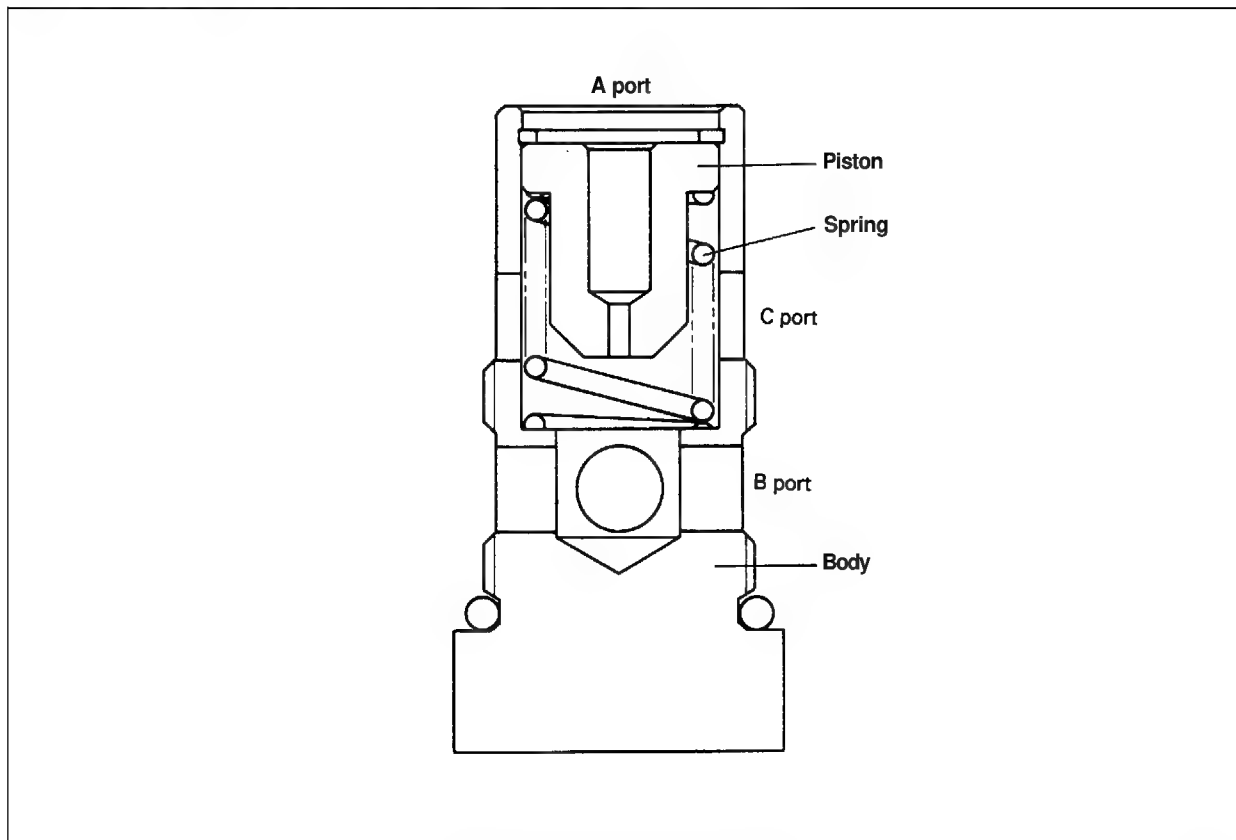
The installation procedure is the reverse of the removal procedure.

Caution:

Flow regulator valve tightening torque:

$$T = 6.0 - 7.0 \text{ kg-m (43.32 - 50.54 ft-lb)}$$

SAFETY DOWN VALVE (V.FSV.FV)



Safety Down Valve Sectional View

LAOS174

REMOVAL

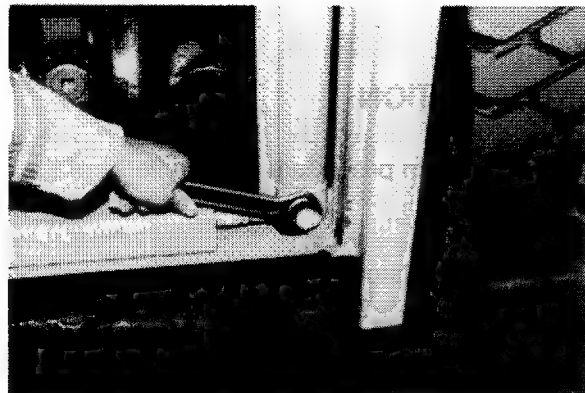
Caution:

- The safety down valve can be removed on the vehicle.
- The safety down valve is set to the lift cylinder LH.

Put the wire on the inner mast (middle mast), and set the hoist to the inner mast (middle mast) tie-beam. Lower the inner mast until it reaches the SST. Then disconnect the cylinder rod end.

SST 09610-22000-7 1

Remove the safety down valve.



Removing the Safety Down Valve

LA0199-17

DISASSEMBLY

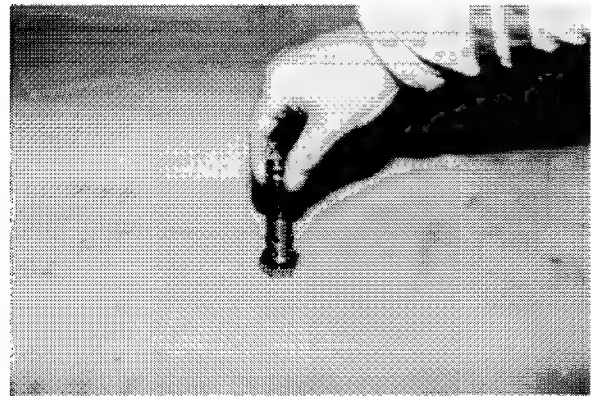
1. Use a snap-ring plier and remove the snap ring.



Removing the Snap-Ring

LA090-10

2. Remove the valve and spring.

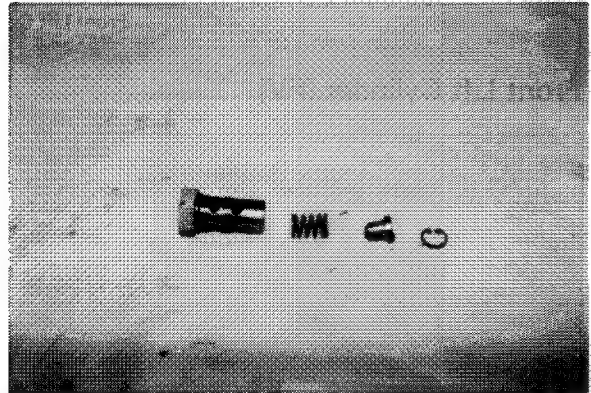


Removing the Valve and Spring

LA090-11

INSPECTION

1. Check the valve for orifice clogging or damage inspection.
2. Check the spring for fatigue, or damage inspection.
3. Check the screw for damage inspection.



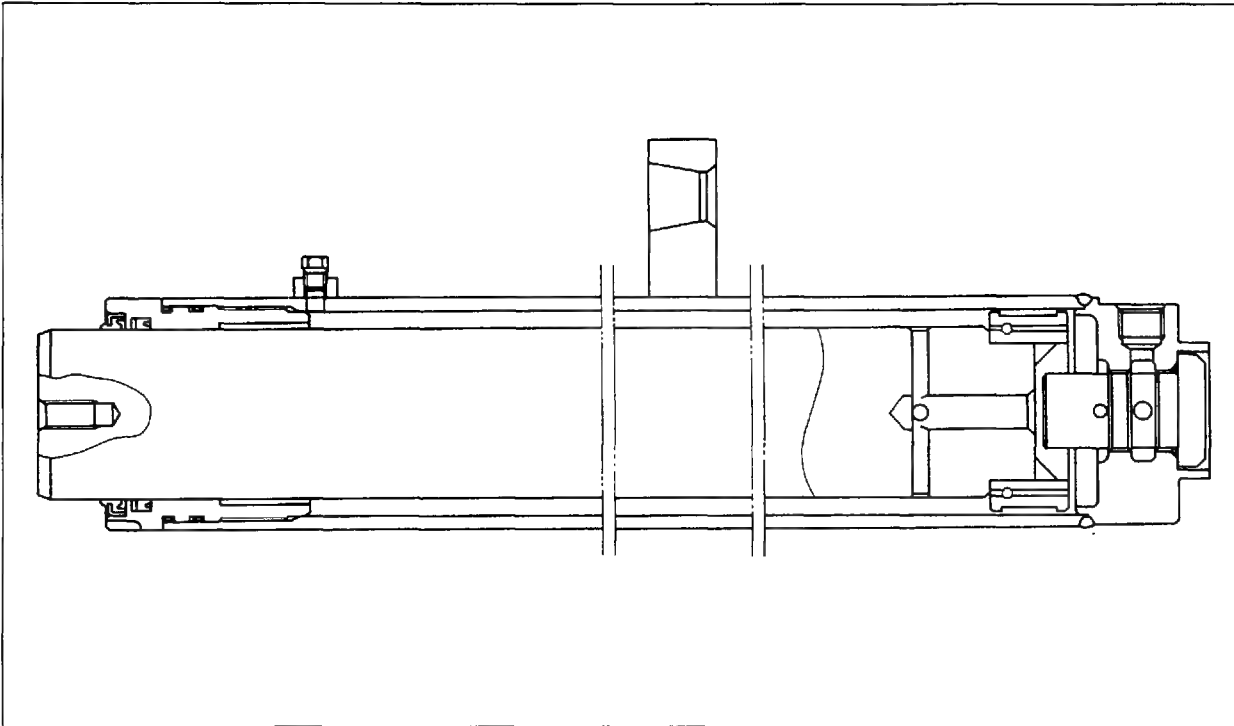
Safety Down Valve Inspection

LA090-12

FRONT LIFT CYLINDER (FSV.FV)

GENERAL

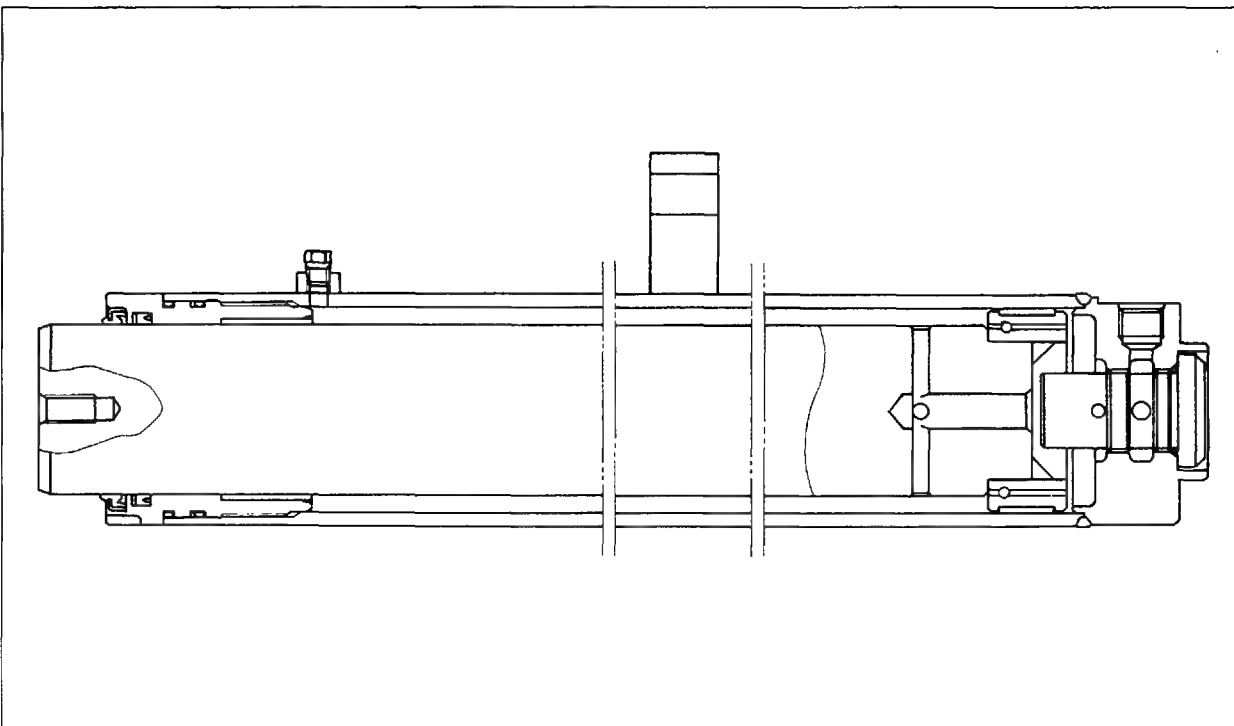
Front Lift Cylinder (FSV)



Front Lift Cylinder Sectional View

LARM77

Front Lift Cylinder (FV)



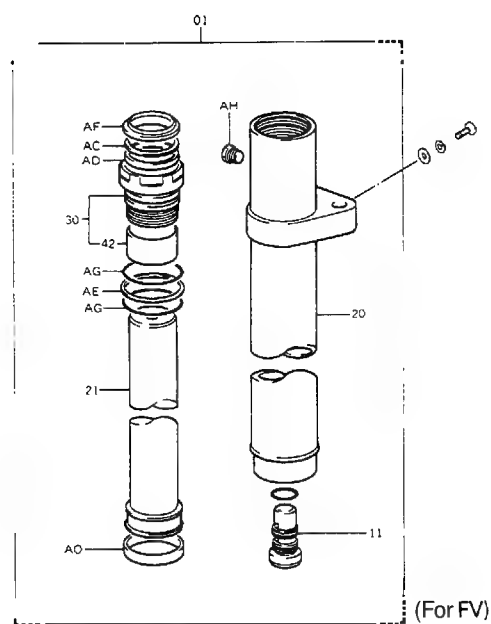
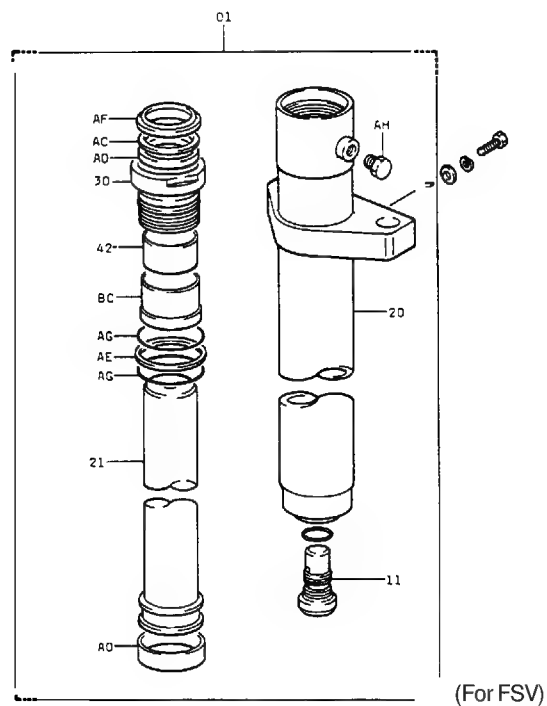
Front Lift Cylinder Sectional View

LARM78

SPECIFICATIONS

Lift cylinder type	Single-acting hydraulic system
Lift cylinder inside diameter	FSV 80 (3.15)
mm (in.)	FV 90 (3.55)
Cylinder rod outside diameter	FSV 70 (2.756)
mm (in.)	FV 75 (2.95)
Piston seal type	Wear ring
Rod seal type	U-packing
Others	with safety down valve

COMPONENTS



- 01 Cylinder ASSY. lift
- 11 Valve ASSY, safety down
- 20 Cylinder SUB-ASSY, lift
- 21 Rod SUB-ASSY, lift cylinder
- 30 Guide SUB-ASSY, lift cylinder rod
- 42 Sleeve, lift cylinder rod guide
- AC Ring, back up

- AD Packing, U
- AE Ring, back up
- AF Seal, dust
- AG Ring, O
- AH Plug
- AO Ring, wear
- BC Stopper

Front Lift Cylinder Components (FSV, FV)

LARM67. 76

REMOVAL

Caution:

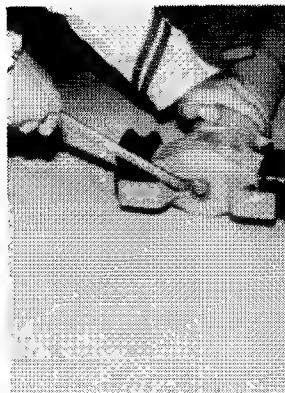
Remove the front lift cylinder **ASSY** according to the lift cylinder **ASSY** (V, FSV).

DISASSEMBLY

1. Remove the chain wheel support.
 - (1) Remove the set bolt and the chain support bolt.

2. Remove the front lift cylinder support **SUB-ASSY** and fitting.

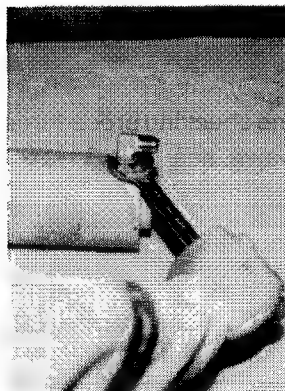
3. Remove the cylinder rod guide.
 - (1) Hold the front lift cylinder **ASSY** cylinder rod guide with a vise, and turn the cylinder with the pipe wrench to remove.



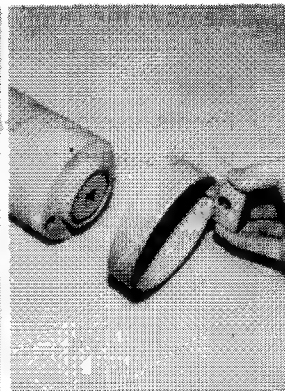
Removing the Support



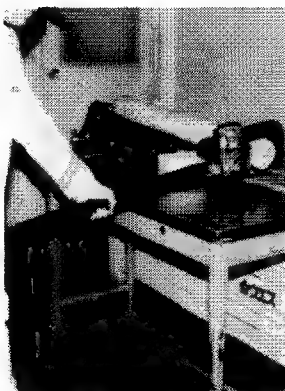
LA0186-11,12



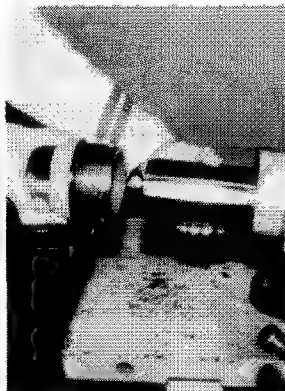
Removing the Support SUB-ASSY



LA0186-14,15



Removing the Rod Guide

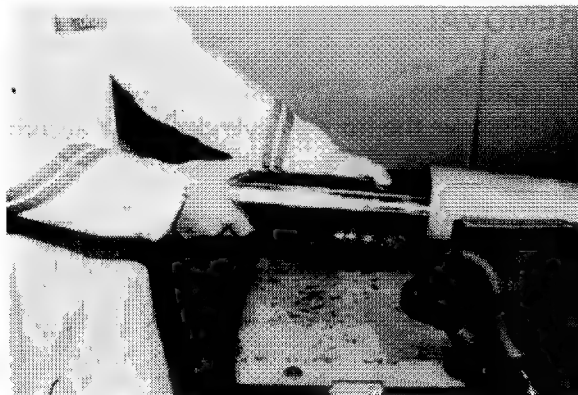


LA0186-16,17

Extract the lift cylinder rod.

Caution:

Draw out the rod straight from the cylinder to prevent the rod from being damaged.



Extracting the Cylinder Rod

LA0186-19

5. Disassemble the piston.
 - (1) Remove the wear ring.



Removing the Wear Ring

LA0186-20

Remove the safety down valve.

Note:

For disassembling and checking procedures of the safety down valve, see page 11-16.



Removing the Safety Down Valve

LA0186-23

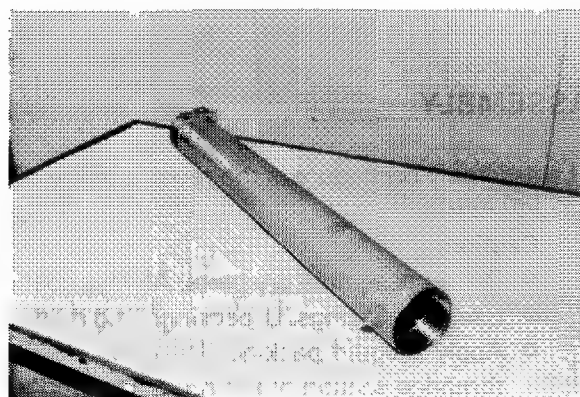
INSPECTION

Caution:

- Oil leaks when the rod guide U-packing seal is defective.
- Wash each part and replace any defective or damaged part.

Lift cylinder inspection

- (1) Check the cylinder sliding surface for wear or damage.
 - Cylinder inside diameter standard:
 - FSV 80.0 mm (3.15 in)
 - FV 90.0 mm (3.55 in)
 - Cylinder bore wear limit:
 - FSV 80.40 mm (3.165 in)
 - FV 90.40 mm (3.56 in)
- (2) Check the cylinder for deformation, damage or rust.
- (3) Check the cylinder surface for local dents.

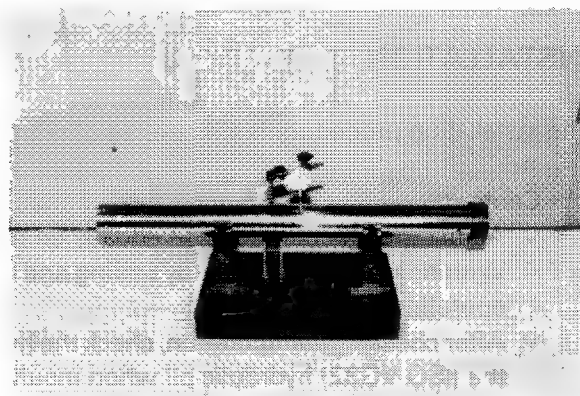


Inspecting the Lift Cylinder

LA0182-16

Piston rod inspection

- (1) Check the piston rod guide for deformation or wear.
 - Piston rod outside diameter standard:
 - FSV 70.0 mm (2.756 in.)
 - FV 75.0 mm (2.95 in.)
 - Piston rod wear limit:
 - FSV 69.91 mm (2.75 in)
 - FV 74.91 mm (2.949 in.)
- (2) Check the plated surface of the rod for exfoliation, damage or rust.
- (3) Check the rod for bending.
 - Rod bending limit: 2.0 mm (0.08 in.)

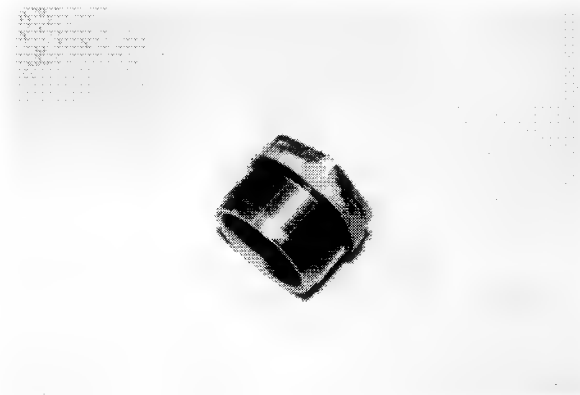


Inspecting the Piston Rod

LA0182-2

Rod guide inspection

- (1) Check the guide sleeve for wear or damage.
- (2) Check the U-packing for wear, damage or deterioration.
- (3) Check the dust seal and O-ring for wear, damage or deterioration.
- (4) Check the cylinder cover for damage.



Inspecting the Rod Guide

LA0182-13

4. Piston inspection

- (1) Check the piston for wear or damage.
- (2) Check the wear ring for wear or damage.



Inspecting the Piston

LA0186-20

ASSEMBLY

The assembly procedure is the reverse of the disassembly procedure.

Caution:

- Do not assemble dry parts. Always coat hydraulic fluid before assembly.
- Use new O-rings, U-packings and dust seals at the time of reassembly.
- Apply a liquid packing (Three bond 1344 blue or equivalent, Part No. 08833-00080) to the threaded section of the rod guide, and tighten.
- The tightening torque of the rod guide is $T = 35 - 45 \text{ kg-m}$ (252.7 — 324.9 ft-lb)

INSTALLATION

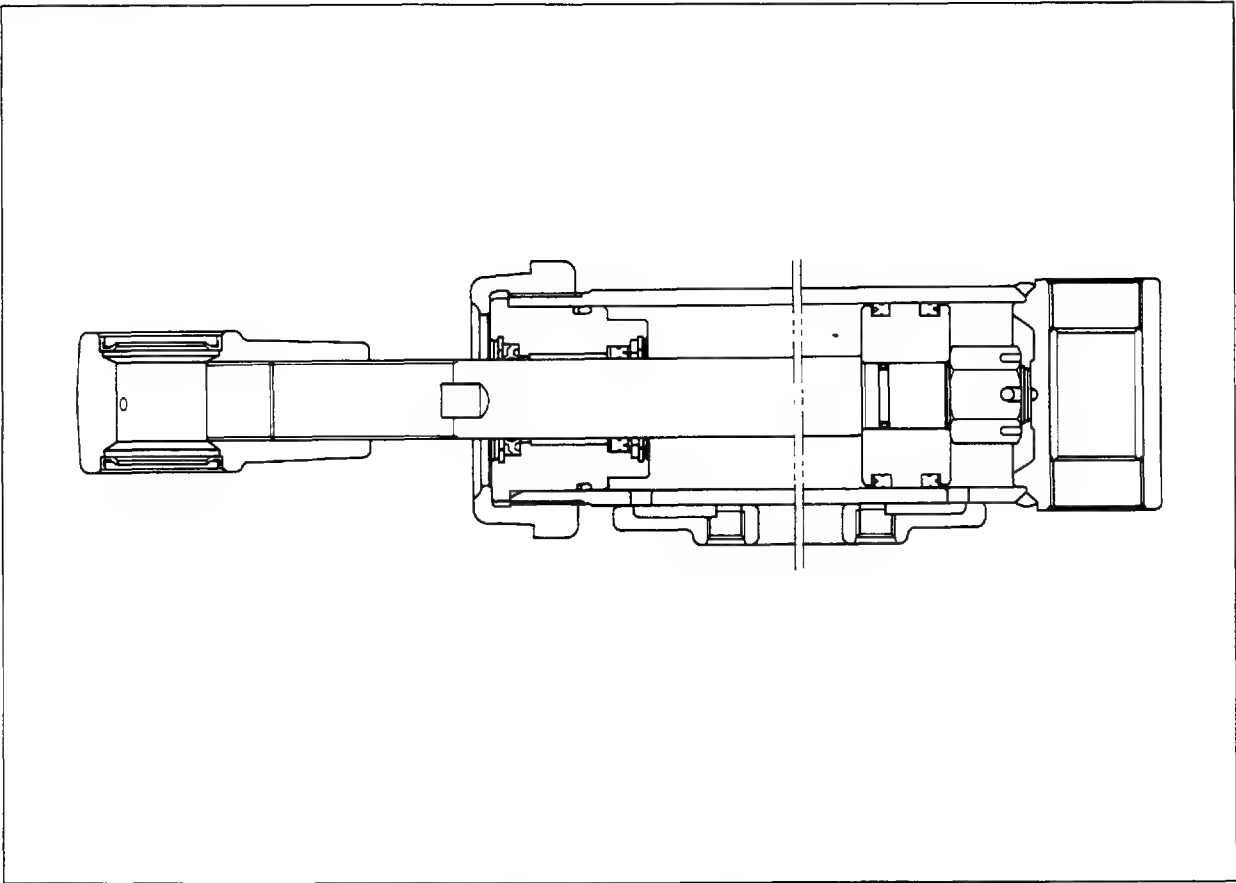
The installation procedure is the reverse of removal procedure.

Caution:

- Adjust the lift chain tension equally on the left and right sides.
- With no load bleed the air by raising and lower the mast to full stroke ends and also, check if the operation is proper.
- After checking the operation, **check the hydraulic oil level** with the level gauge. If insufficient, add the **(ISO VG32)** hydraulic oil when insufficient.
- Check if the maximum lifting height is as specified.

TILT CYLINDER (V.FSV.FV)

GENERAL



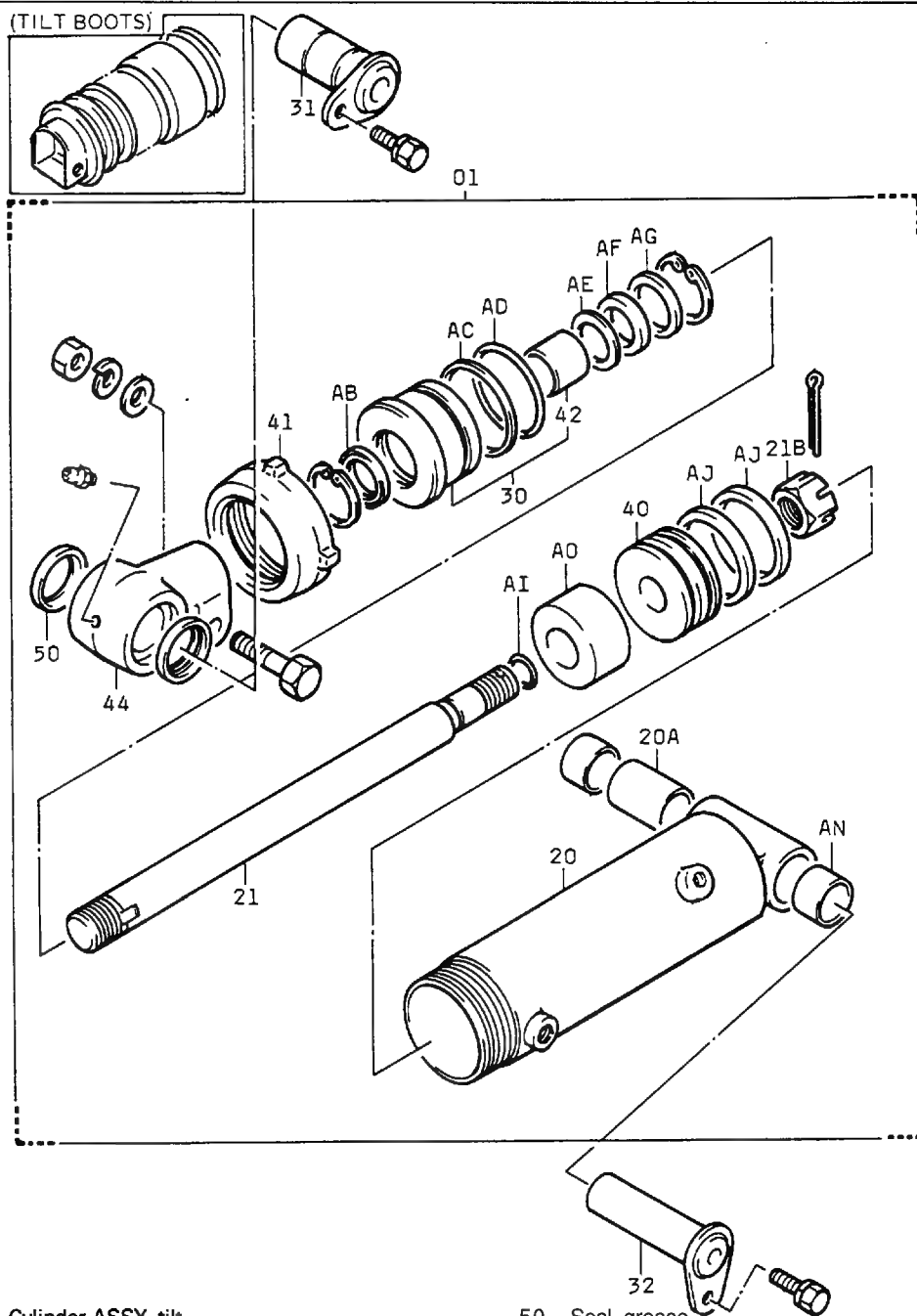
Tilt Cylinder Sectional View

LAOM64

SPECIFICATIONS

Tilt cylinder system	Double-acting hydraulic system
Tilt cylinder inside diameter	70 mm (2.76 in.)
Piston Rod outside diameter	30 mm (1.18 in.)
Piston stroke	88 mm (3.46 in.)
Piston seal type	U-packing
Rod seal type	U-packing

COMPONENTS



- 01 Cylinder ASSY, tilt
- 20 Cylinder SUB-ASSY, tilt
- 20A Bushing, pin
- 21 Rod SUB-ASSY, tilt cylinder piston
- 21B Nut, castle
- 30 Guide SUB-ASSY, tilt cylinder rod
- 31 Pin SUB-ASSY, tilt cylinder, FR
- 32 Pin SUB-ASSY, tilt cylinder, FR
- 40 Piston, tilt cylinder
- 41 Cover, tilt cylinder
- 42 Sleeve, tilt cylinder rod guide
- 44 Joint, piston rod

- 50 Seal, grease
- AB Seal, dust
- AC Ring, back up
- AD Ring, O
- AE Ring, back up
- AF Packing, U
- AG Plate, stopper
- AI Ring, O
- AJ Packing, U
- AN Collar
- AO Spacer, tilt control

Tilt Cylinder Components

LARM68

REMOVAL

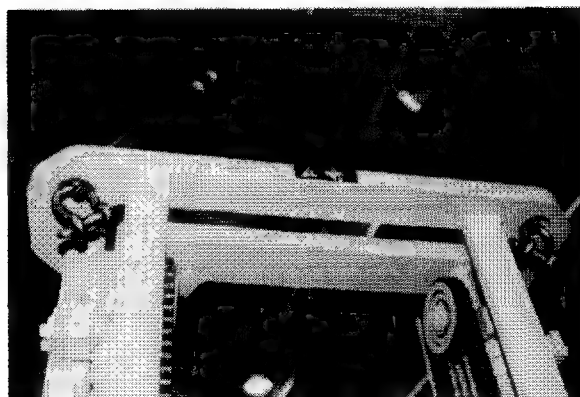
Caution:

The tilt cylinder U-packing can be replaced on the vehicle without removing the cylinder ASSY. This section mainly describes the disassembly after cylinder removal.

1. Remove the tilt cylinder front pin.
 - (1) Operate the oil control lever and lower the fork to the lowest position, and tilt the mast fully forward.

Caution:

Be sure to hang the mast ASSY with wire for safety.



Hanging the Mast ASSY with Wire

LAR35-30

- (2) Remove the set bolt, and remove the front pin by using the SST.
- SST 09810-20172-71



Removing the Front Pin

LAR35-35

2. Disconnect the piping.
 - (1) First, carefully check the oil in the rear side high pressure hose piping. Then gradually warm up the piping to lower the oil pressure, and remove the piping.
 - (2) Remove the front side high pressure hose piping in the same way as for the rear side piping.

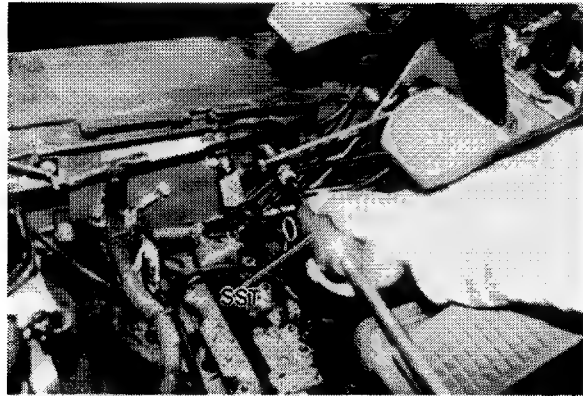


Disconnecting the Piping

LAR35-37

3. Remove the tilt cylinder rear pin.
 - (1) Toe-board
 - (2) Rear pin set bolt
 - (3) Rear pin

SST 09810-20172-71



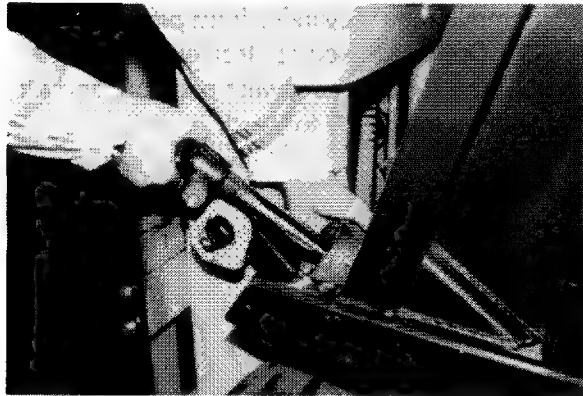
Removing the Rear Pin

LAR35-42

4. Remove the tilt cylinder ASSY.
 - (1) Tilt cylinder ASSY.

Caution:

Do not damage the piping.



Removing the Tilt Cylinder ASSY

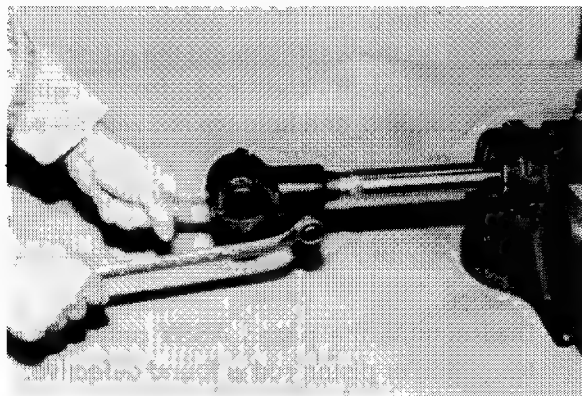
LAR36-8

DISASSEMBLY

1. Remove the piston rod joint.
 - (1) Hold the tilt cylinder ASSY with a vise, and remove the rod joint set bolt.

Caution:

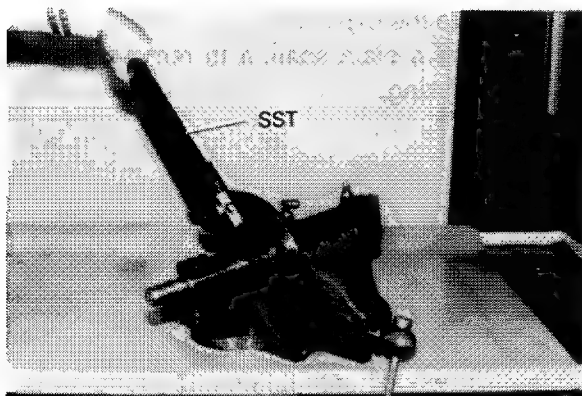
Write down how much the joint is screwed in.



Removing the Rod Joint

LA0118-5

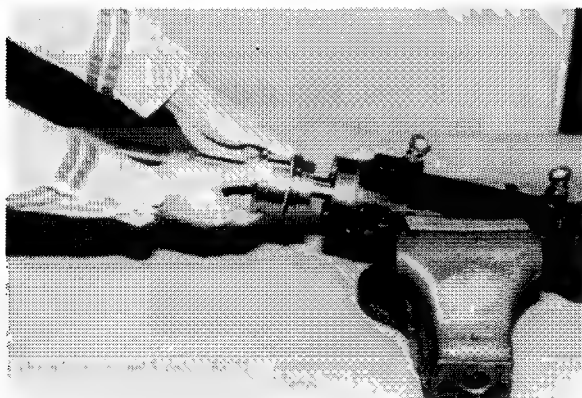
2. Remove the tilt cylinder cover.
 - (1) Use the SST and remove the tilt cylinder cover.
SST 09620-10160-71



Removing the Cylinder Cover

LA0118-6

3. Remove the rod guide.



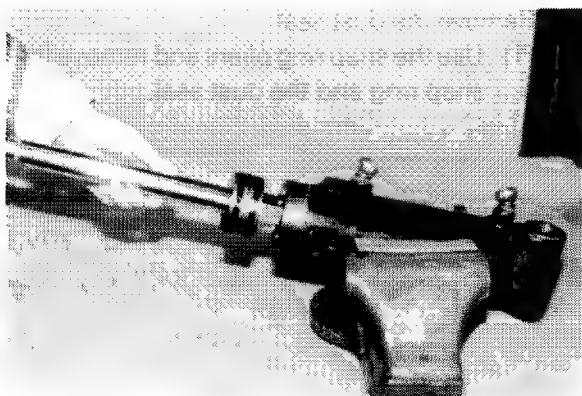
Removing the Rod Guide

LA0118-8

4. Extract the piston rod.

Caution:

Draw out the cylinder rod straight.



Extracting the Piston Rod

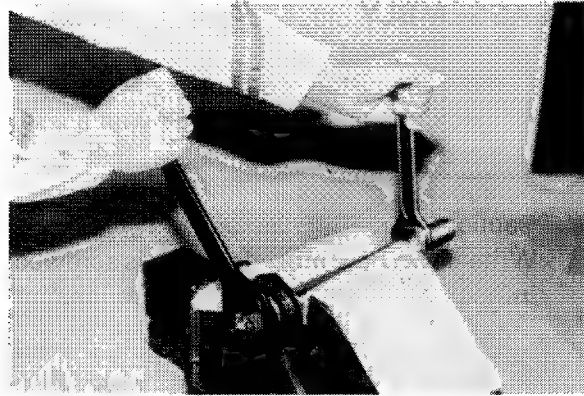
LA0118-11

Remove the piston.

- (1) Tie up the waste around the piston rod to prevent the rod from being scratched, and hold the rod with a vise.
- (2) Remove the cotter pin.
- (3) For the castle nuts use two spanners and remove the piston.

Caution:

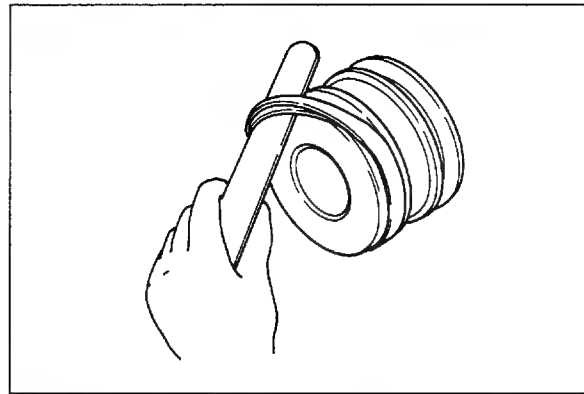
Disassemble the piston ASSY only when the piston or piston rod is found defective.



Removing the Rod Joint

LAO118-13

6. Remove the U-packing.
 - (1) Use a plain spatula to remove the U-packing.



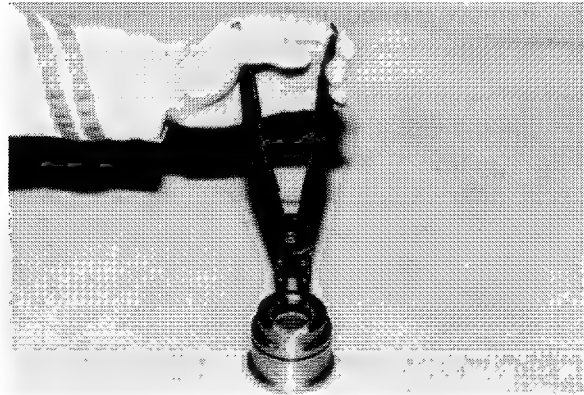
Removing the U-packing

KADS27

7. Remove the piston rod guide.
 - (1) Use the snap ring pliers and remove the snap ring, stop plate, U-packing and back up ring.

Caution:

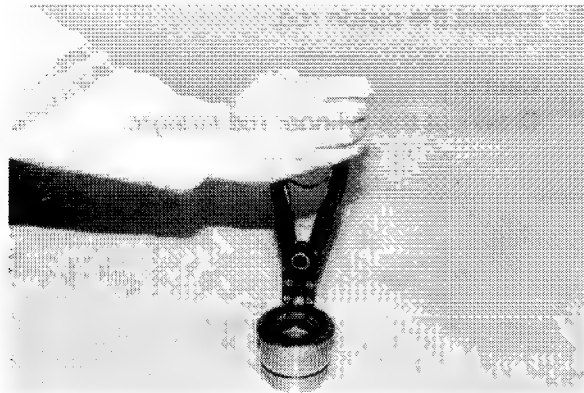
The sleeve is pressed only when it is found defective.



Removing the Rod Guide

LAO118-18

8. Remove the dust seal.
 - (1) Use the snap ring pliers and remove the snap ring and the dust seal.



Removing the Dust Seal

LAO118-22

INSPECTION

Caution:

- Oil leaks when the rod guide U-packing seal is defective.
- Hydraulic drift occurs results when the piston U-packing is defective.
- Wash each part and replace any defective or damaged part.

Tilt cylinder inspection

- (1) Check the inside cylinder guide for deformation or wear.

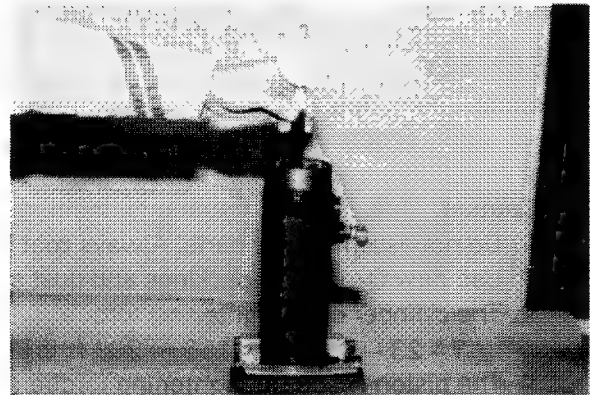
Cylinder inside diameter:

70.0 mm (2.76 in.)

Inside cylinder guide wear limit:

70.35 mm (2.77 in.)

- (2) Check the cylinder for deformation, damage or rust.
- (3) Check the cylinder surface for local dents.



Inspecting the Tilt Cylinder

LAO118-27

Piston rod inspection

- (1) Check the piston rod guide for deformation or wear.

Piston rod outside diameter:

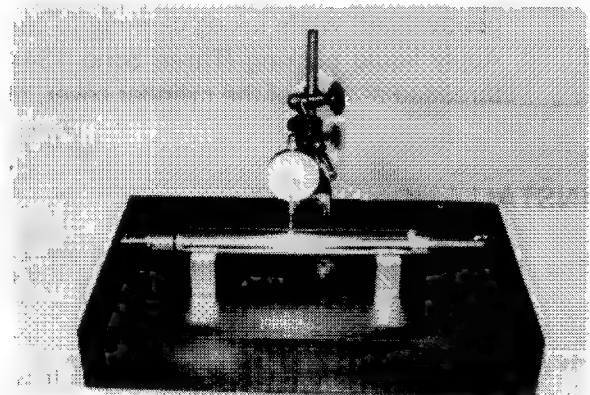
30.0 mm (1.18 in.)

Piston rod outer wear limit:

29.92 mm (1.178 in.)

- (2) Check the plated surface of the piston rod for exfoliation, damage or rust.
- (3) Check the rod for bending.

Rod bending limit: 1.0 mm (0.04 in.)



Inspecting the Piston Rod

LAO118-24

Piston inspection

- (1) Check the piston for wear or damage.
- (2) Check the U-packing for wear, damage or deterioration.

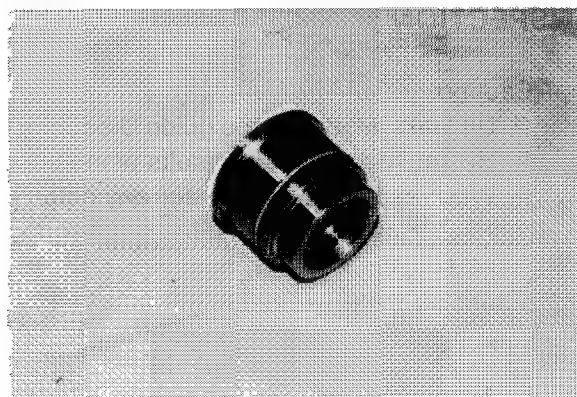


Inspecting the Piston

LAO118-16

Rod guide inspection

- (1) Check the guide sleeve for damage.
- (2) Check the U-packing for wear, damage or deterioration.
- (3) Check the dust seal, O-ring, and back-up ring for wear, damage or deterioration.
- (4) Check the rod guide for damage.
- (5) Check the cylinder cover for damage.

**Rod Guide Inspection****LAO118-23****ASSEMBLY**

The assembly procedure is the reverse of disassembly procedure.

Caution:

- Do not assemble dry parts. Always coat hydraulic fluid before assembly.
- Use new O-rings, U-packings and dust seals.
- The cylinder cover tightening torque
 $T = 23 - 29 \text{ kg-m (166 - 209 ft-lb)}$
- The piston castle nut tightening torque
 $T = 23 - 29 \text{ kg-m (166 - 209 ft-lb)}$
- Before the rod guide is installed, wrap vinyl tape thinly around the thread of the piston rod. Then, gently insert while taking care not to damage the seals.
- Apply liquid packing (Three bond 1344 blue or equivalent, Part No. 08833-00080) to the threaded section of the cylinder cover, then tighten.

INSTALLATION

The installation procedure is the reverse of the assembly procedure.

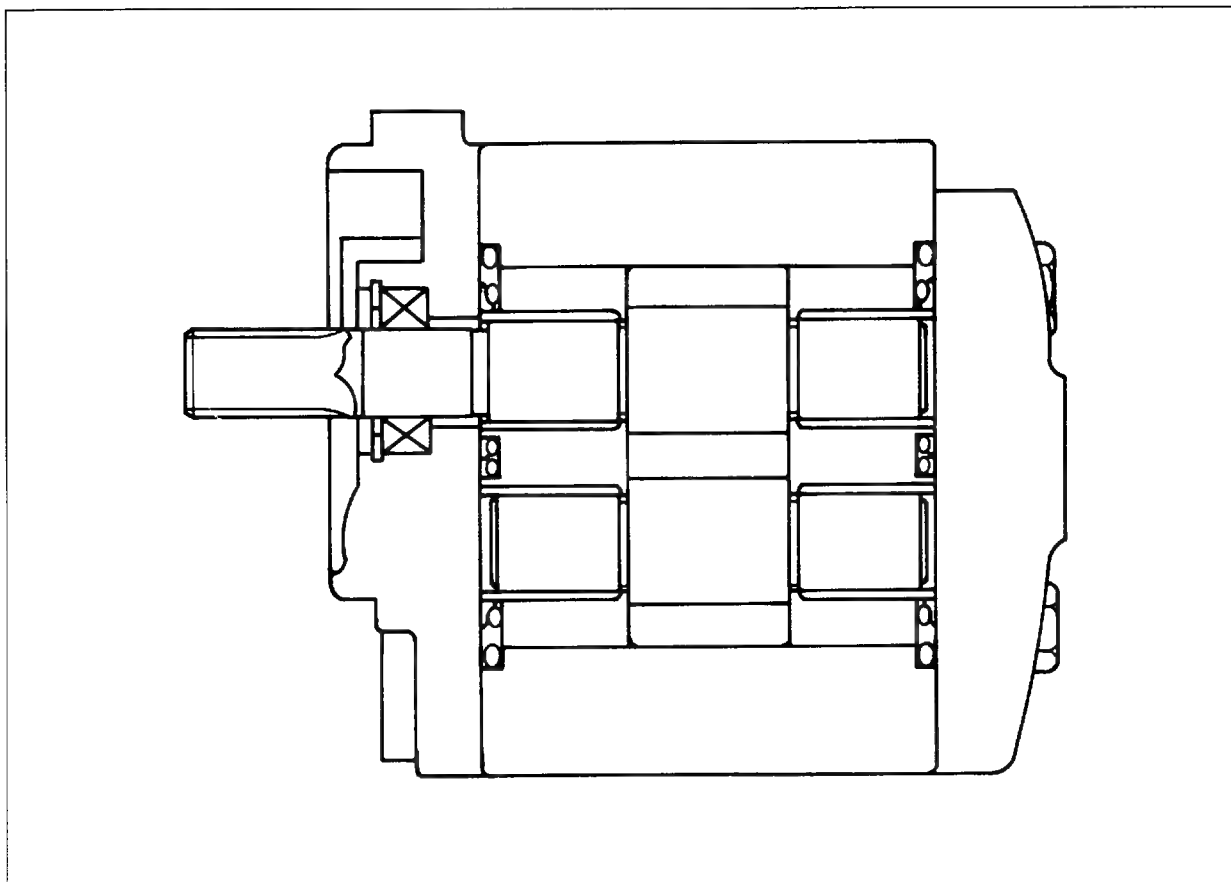
Caution:

- When installing the rod joint, check to see if it was adjusted to the rod joint installation length being registered during removal.
- Lift the fork by approx. 200 mm (7.88 in.), and check and adjust the forward and backward tilt angles.
- The rod joint set bolt tightening torque
 $T = 7.5 - 11.4 \text{ kg-m (54.2 - 82.4 ft-lb)}$
- Put the adjusting marks (red-painted) on the joint and rod.
- Slowly tilt the mast forward and backward a few times, and check to see if the operation is proper.
- After checking the hydraulic oil level with the level gauge. If insufficient, add hydraulic oil.
- Coat MP grease on the tilt cylinder front pin and the insertion section.
- Coat MP grease on the tilt cylinder rear pin and the insertion section.
- Tilt the mast fully forward and backward, and check if the mast movement is straight without unevenness between one left and right.

OIL PUMP

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REMOVAL	12-4
DISASSEMBLY	12-5
INSPECTION	12-7
ASSEMBLY	12-8
TEST PROCEDURE	12-11

GENERAL



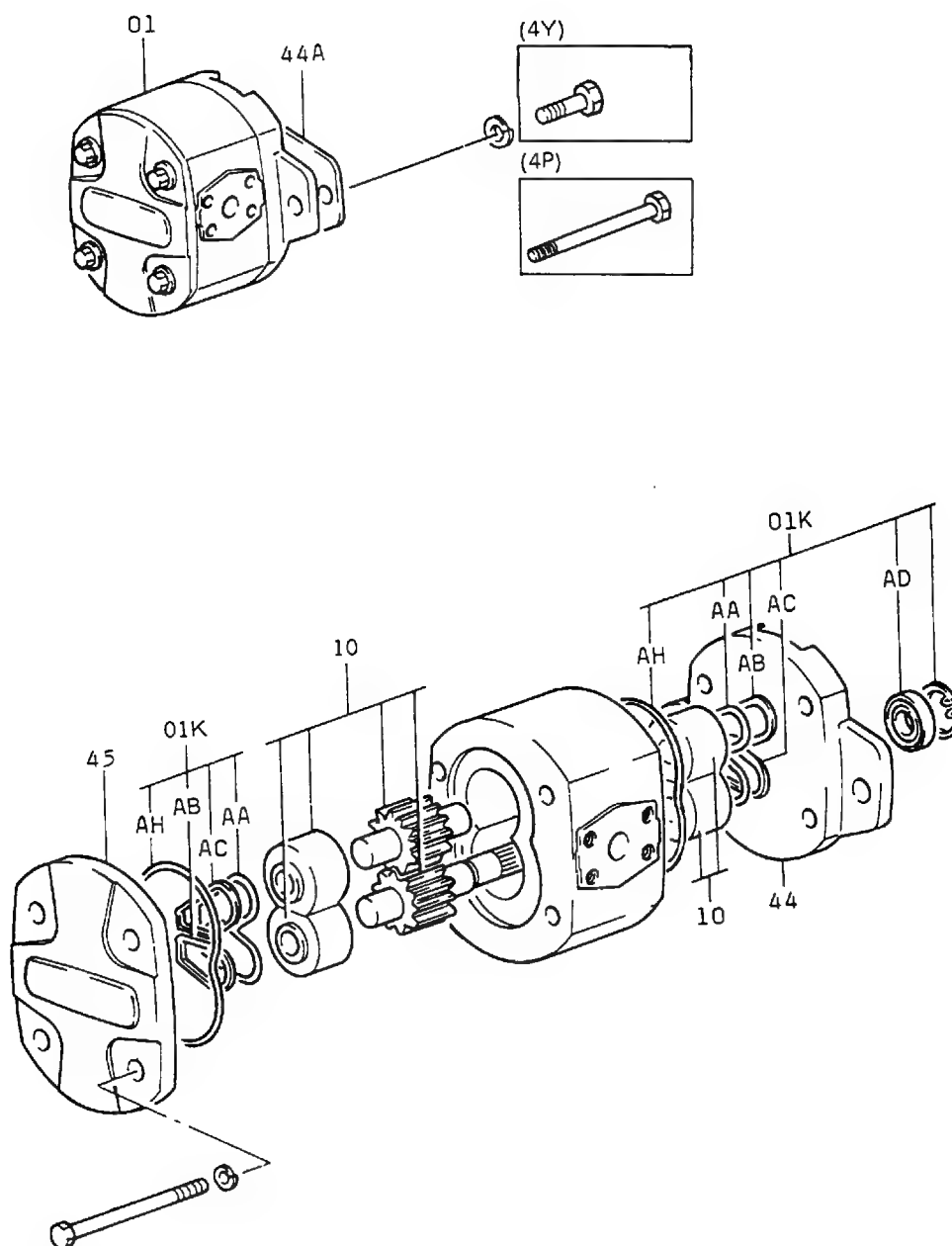
Oil Pump Sectional View

LAOM65

SPECIFICATIONS

Item	Model	
	4P engine model	4Y engine model
Oil Pump type	Gear pump KZP4-21 C	Gear pump KZP4-25C
Theoretical discharge amount cc/rev (in ³ /rev)	21.0 (1.28)	24.5 (1.49)
Discharge amount (Pump: 1500 rpm) ℓ/min (gal/min)	30.6 (8.0)	35.6 (9.3)
Drive system	P.T.O silent chain system	P.T.O gear system

COMPONENTS

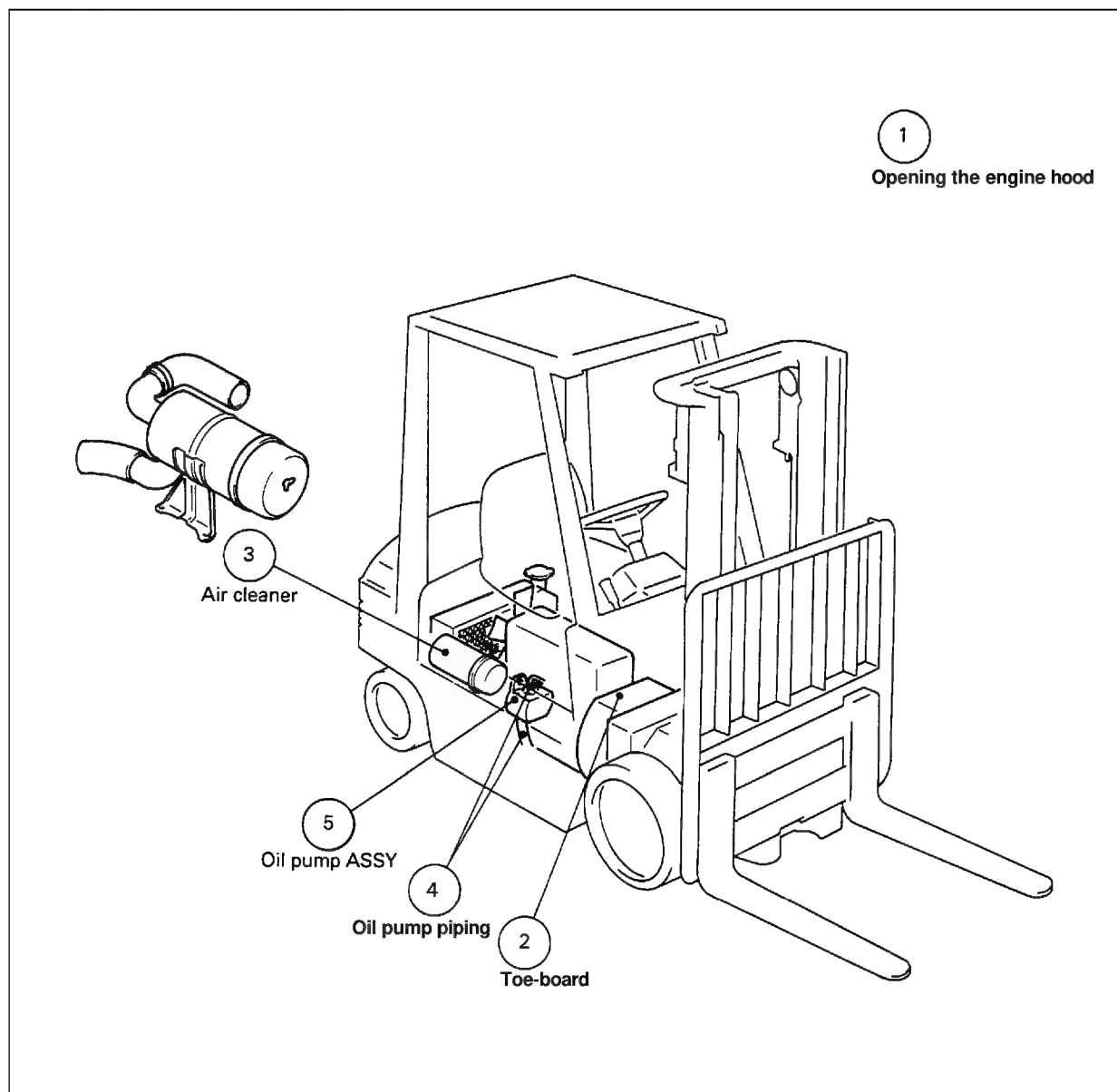


01 Pump ASSY, oil
 01K Pump O/H kit, oil
 10 Gear set
 44 Flange, mounting
 44A Packing, oil pump
 45 Cover

AA Seal, bushing
 AB Ring, backing, RH
 AC Ring, backing, LH
 AD Seal, oil
 AH Seal, body

OIL PUMP ASSY

REMOVAL



Oil Pump Removal

LARM75

Removing Process

1. Open the engine hood
2. Remove the toe-board
3. Remove the air cleaner ASSY
 - (1) Air cleaner
 - (2) Piping
 - (3) Set bolt
 - (4) Air cleaner hose
4. Remove the oil pump piping
 - (1) High pressure hose
 - (2) Low pressure hose
5. Remove the oil pump ASSY
 - (1) Set bolts
 - (2) Oil pump ASSY

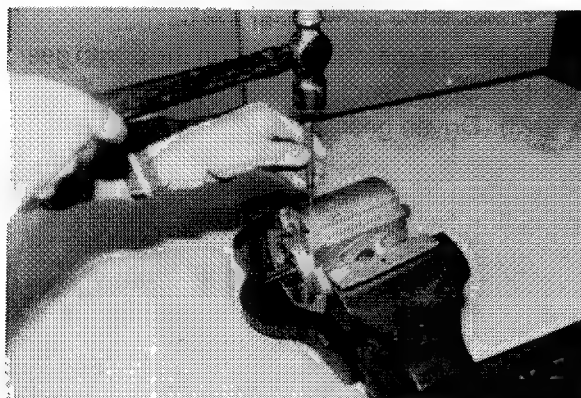
DISASSEMBLY

Caution:

- Do this job at a clean place.
- In washing parts, be sure to use fresh hydraulic oil.

Remove the pump cover

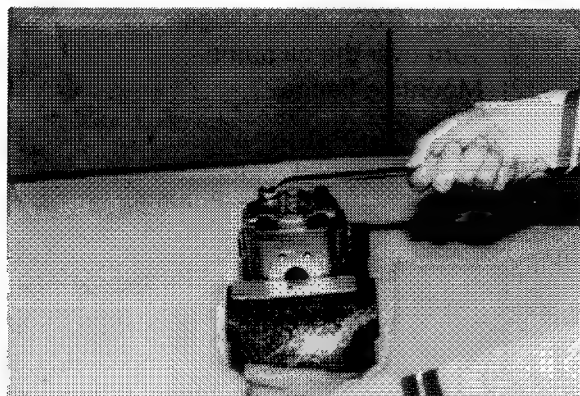
- (1) Set the oil pump ASSY to a vice.
- (2) Stamp the match mark on the pump body and cover.



Stamping the Match Mark

LA033-2

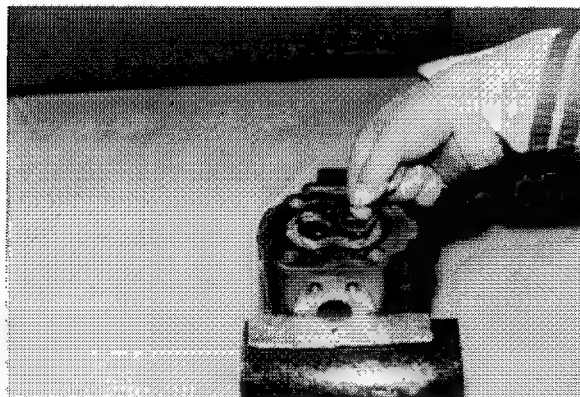
- (3) Set bolts
- (4) Pump cover



Removing the Pump Cover

LA033-3

2. Remove the seals
 - (1) Backing ring
 - (2) Bush seal
 - (3) Body seal



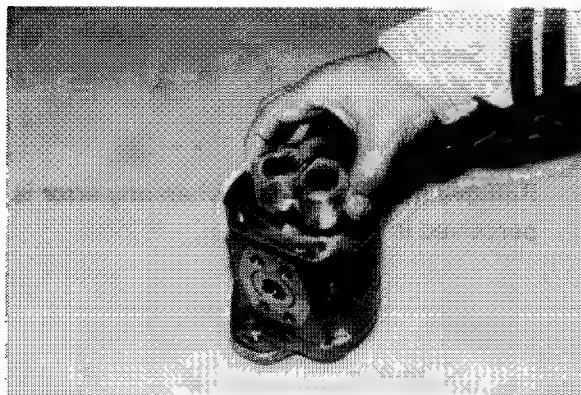
Removing the Seals

LA033-5

3. Remove the bush No. 1
 - (1) Remove the oil pump from the vice.
 - (2) Bush No. 1

Caution:

Be sure to check the direction and combination of bushes beforehand not to mistake their setting.



Removing the Bush No. 1

LA033-7

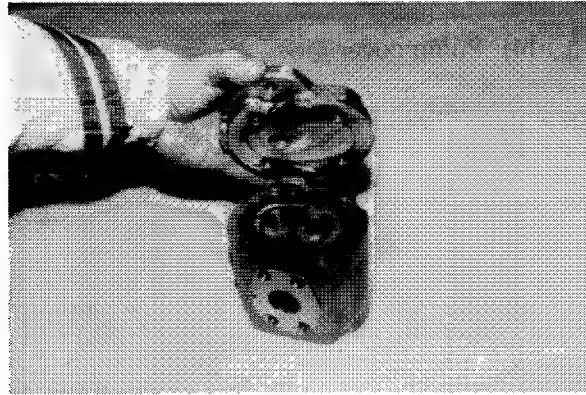
4. Remove the pump gear
 - (1) Put a matching mark on the pump gear.
 - (2) Drive gear
 - (3) Driven gear



Removing the Pump Gear

LA033-8

5. Remove the mounting flange
 - (1) Turn over the oil pump
 - (2) Mounting flange



Removing the Mounting Flange

LA033-10

6. Remove the seals
 - (1) Backing ring
 - (2) Bush seal
 - (3) Body seal
 - (4) Bush No. 1



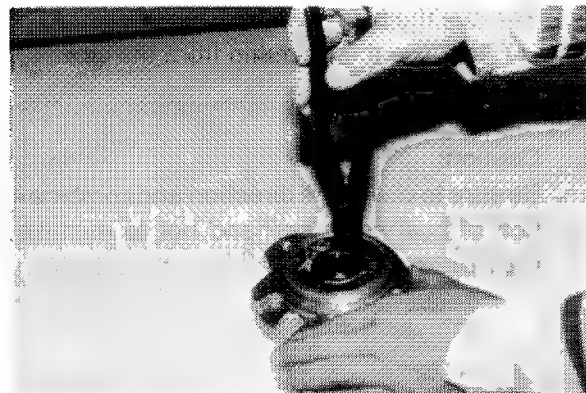
Removing the Seals

LA033-11

7. Remove the oil seal
 - (1) Snap ring
 - (2) Oil seal

Caution:

Remove the oil seal only when any error is perceived in it.



Removing the Oil Seal

LA033-16

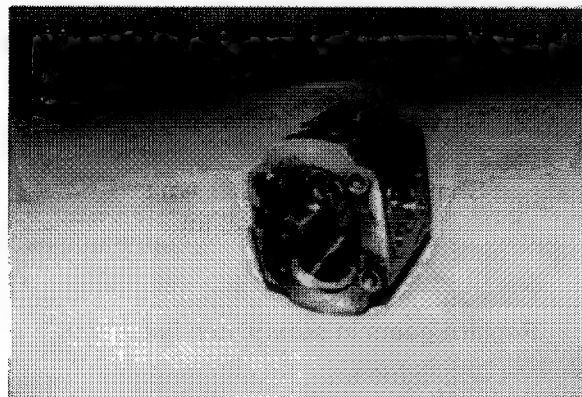
INSPECTION

Caution:

Disassembled parts shall be checked first for their stain and discoloration, and then cleaned and inspected.

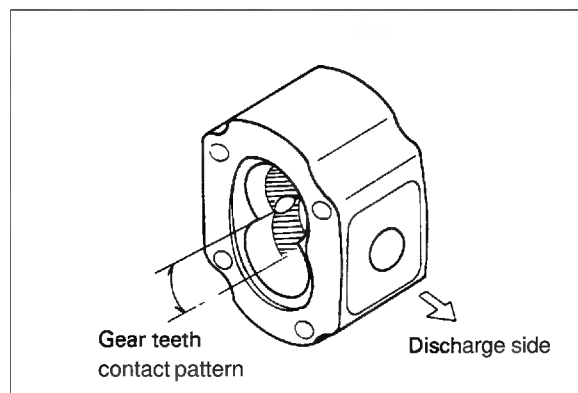
1. Body, cover, and flange inspection

- (1) Gear contacting trace on the body inner surface suction side.
(Normal = Contacting trace of about $1/3$ of the body inner circumference)
- (2) Damage on every doubling surface.
- (3) Damage on mounting section and of every screw.
- (4) Flaw on the body inner surface.
Flaw depth limit: 0.1 mm (0.004 in)



Inspecting the Pump Body

LA033-15

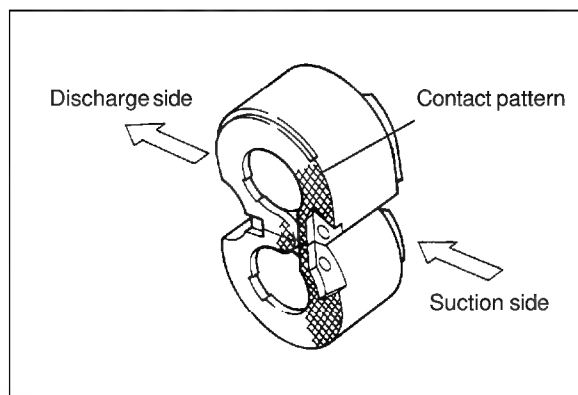


Tooth Top Contacting Trace

JAAS37

2. Bush No. 1 inspection

- (1) Contact on the bore sliding surface.
(Normal = Glossy contacting trace on about a half on the suction side)
- (2) Flaw on the bore sliding surface.
Bush bore limit:
19.123 mm (0.753 in)



Bush Contacting Trace

JAAS38

- (3) Contact on the side
(Normal = Contact perceived a little stronger on the suction side and rather weak on the discharge side)
- (4) Flaw on the flank
Limit length in bush axial direction:
26.411 mm (1.040 in)



Inspecting the Bush No. 1

LA033-22

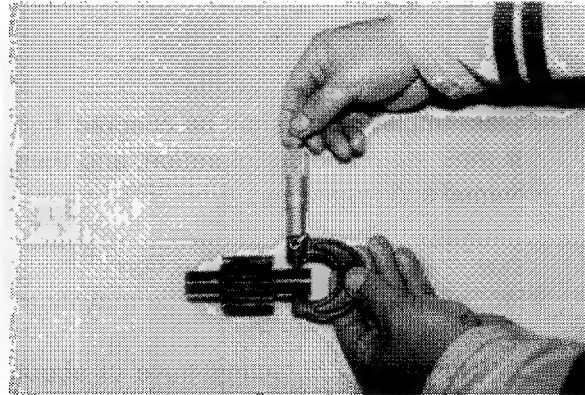
Gear inspection

- (1) Crack at the root of tooth or flaw on the tooth flank.
- (2) Flaw on tooth surface
- (3) Flaw on gear shaft

Shaft outside diameter limit:
18.935 mm (0.745 in)

Caution:

Replace gears in set without fail.



Inspecting the Gears

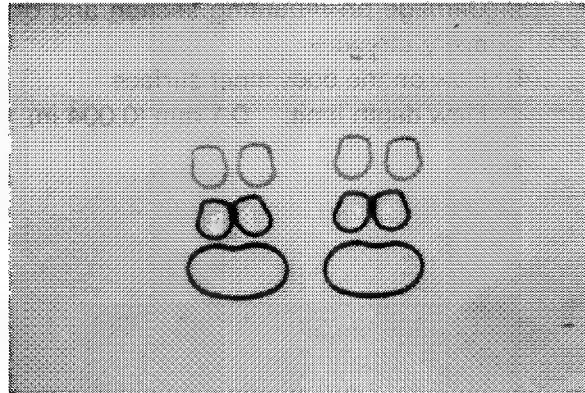
LA033-19

Seals inspection

- (1) Tear or breakage of packing ring.

Caution:

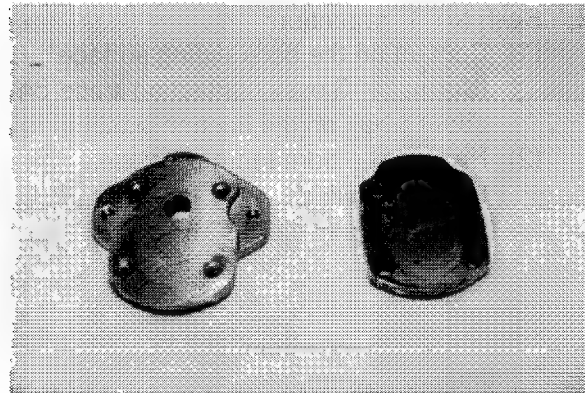
Be sure to replace body seal and bush seal after the disassembly.



Inspecting the Seals

LA033-24

- (2) Flaw or deformation of the lip of oil seal.



Inspecting the Oil Seal

LA033-25

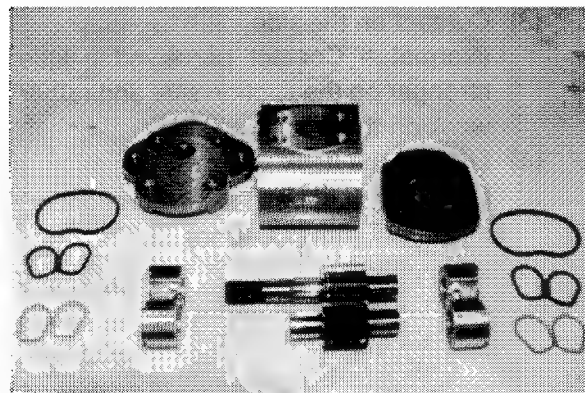
ASSEMBLY

Caution:

Clean every component part sufficiently, blow them with compressed air, apply them hydraulic oil, and then assemble them.

Arrangement of component parts of oil pump

- (1) Clean each component part with compressed air and then put them in good order on a work bench.



Assembling the Oil Pump

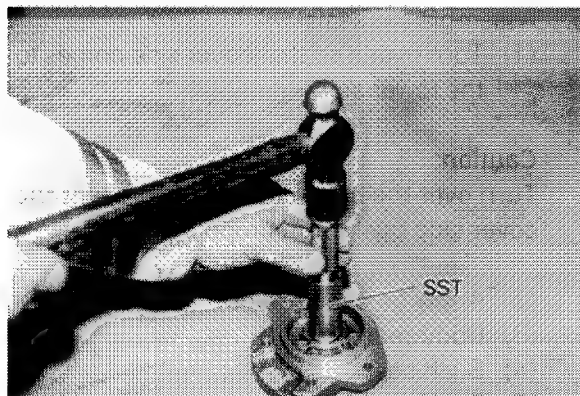
LA033-28

Assemble the oil seal

- (1) Oil seal
SST 09620-30010
- (2) Snap ring

Caution:

This assembly shall be made only when the oil seal is removed due to a defect.



Assembling the Oil Seal

LA027-7

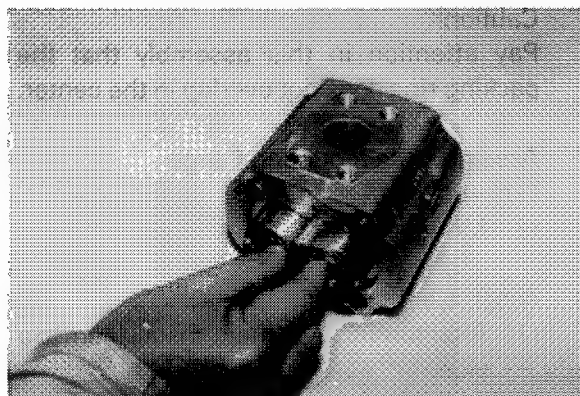
Assemble the bush No. 1

- (1) Apply hydraulic oil to the bush No. 1 on the mounting flange side and insert it into the body by aligning the bush notched section to the discharge side.

Caution:

Insert bush No. 1 with hands, not drive in, so that the dowel of the body comes to the suction side without fail.

In this assembly, the dowel of the body must come to the suction side and bush No. 1 be inserted with hands without driving in.



Assembling the Bush No. 1

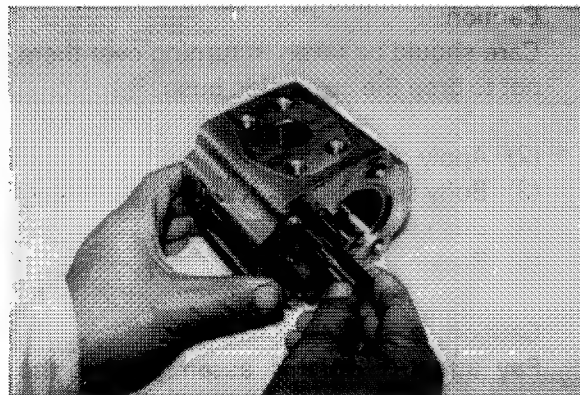
LA033-31

Assemble the pump gear

- (1) Assemble the driven gear in alignment with the matching mark on the drive gear.

Caution:

Assemble the two gears so that their meshed surfaces meet again.



Assembling the Pump Gear

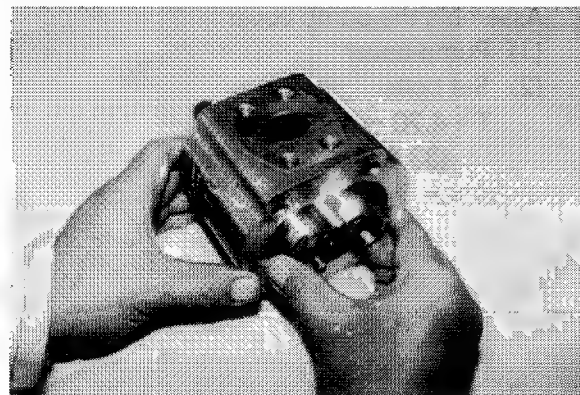
LA033-34

Assemble the bush No. 1

- (1) Apply hydraulic oil to bush No. 1 on the cover side and then insert it to the body by aligning the notched portion of the bush with the discharge side.

Caution:

Assemble the gear carefully not to mistake the discharge side and suction side in the bush direction.



Assembling the Bush No. 1

LA033-35

Assemble the seals

- (1) Turn over it so that cover side comes to the lower side.

Caution:

Turn over the bush carefully to prevent the cover side bush from dropping.

- (2) Apply grease to seals
- (3) Body seal
- (4) Bush seal
- (5) Backing ring

Caution:

Pay attention in this assembly that the packing ring does not overlap in the center.

Assemble the mounting flange

- (1) Apply grease to seals
- (2) Mounting flange

Assemble the seals

- (1) After turning over them, install them to a vice.

Caution:

Care should be taken in turning over them not to drop the cover side bush.

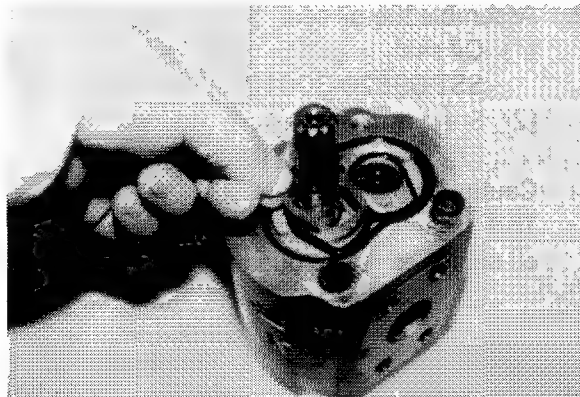
- (2) Apply grease to seals
- (3) Body seal
- (4) Bush seal
- (5) Backing ring

Caution:

Pay attention in this assembly that the packing ring does not overlap in the center.

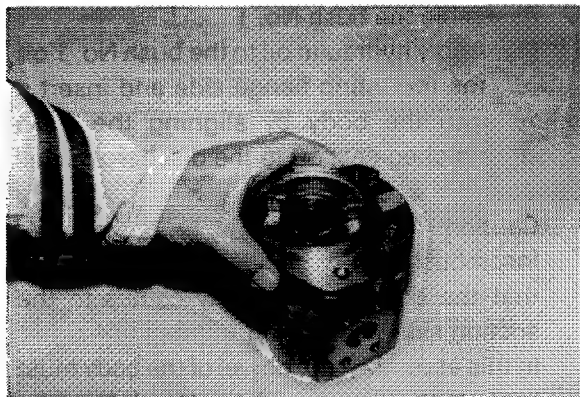
Assemble the pump cover

- (1) Pump cover
- (2) Set bolts
 $T = 4.70 \sim 4.96 \text{ kg-m}$
 $(33.934 \sim 35.811 \text{ ft-lb})$



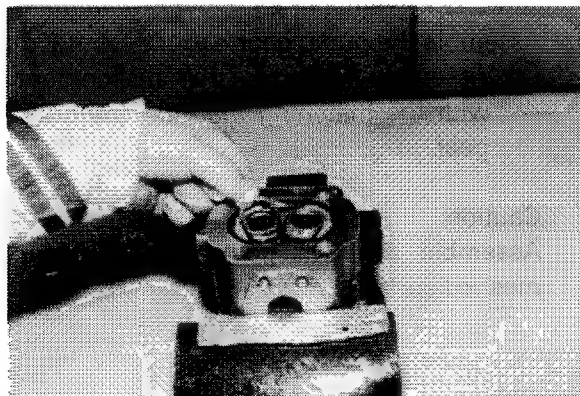
Assembling the Seals

LA034-7



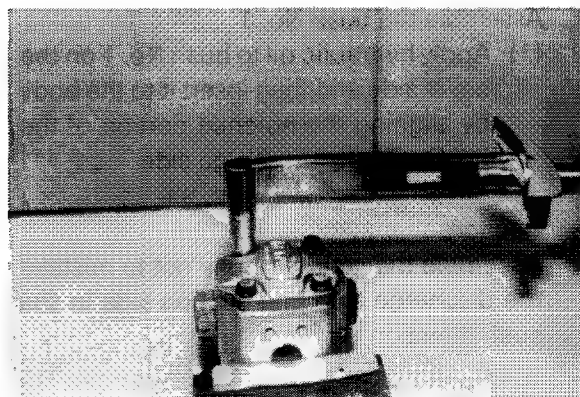
Assembling the Mounting Flange

LA034-8



Assembling the Seals

LA034-12

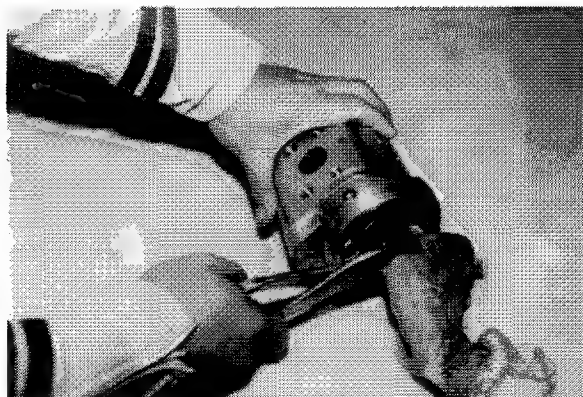


Assembling the Pump Cover

LA034-13

10. Check of oil pump assembling

- (1) Wind a clock around the drive gear shaft and turn the pump by holding it with pliers.
- (2) When turned lightly, it is treated as good. When hard to be turned, disassemble the pump again.
- (3) When assembled well, fill hydraulic oil in the oil pump after the end of assembly.



Checking the Pump Turning Condition

LA034-14

TEST PROCEDURE

Caution:

A bench test shall be made in a strict inspection. Since it is impossible to do so in an actual service, however, install the oil pump to a vehicle to make a good/no good decision on the delivery of the pump according to the operation of its cylinder.

1. Installation of oil pressure gauge and engine tachometer.
 - (1) Set the oil pressure gauge (500 kg/cm²) (7110 psi) and engine tachometer to the oil control valve.
2. Running in of oil pump
 - (1) Start the engine, and with the oil control valve lever kept neutral, run the engine for 10 minutes at 500 to 1000 rpm.
3. When no error is detected in the oil pump, run the engine for 10 minutes further at 1500 to 2000 rpm.

Caution:

When any error is perceived in steps 2 and 3 above, stop the engine immediately and disassemble the oil pump over again.

4. Check if the relief set pressure of the oil control valve is as specified.
For its details, refer to the item of adjustment of the oil control valve.
5. Check if the RPM engine is as specified.
For its details, refer to the item of adjustment of RPM of engine.
6. Lifting speed table (Average for full stroke)

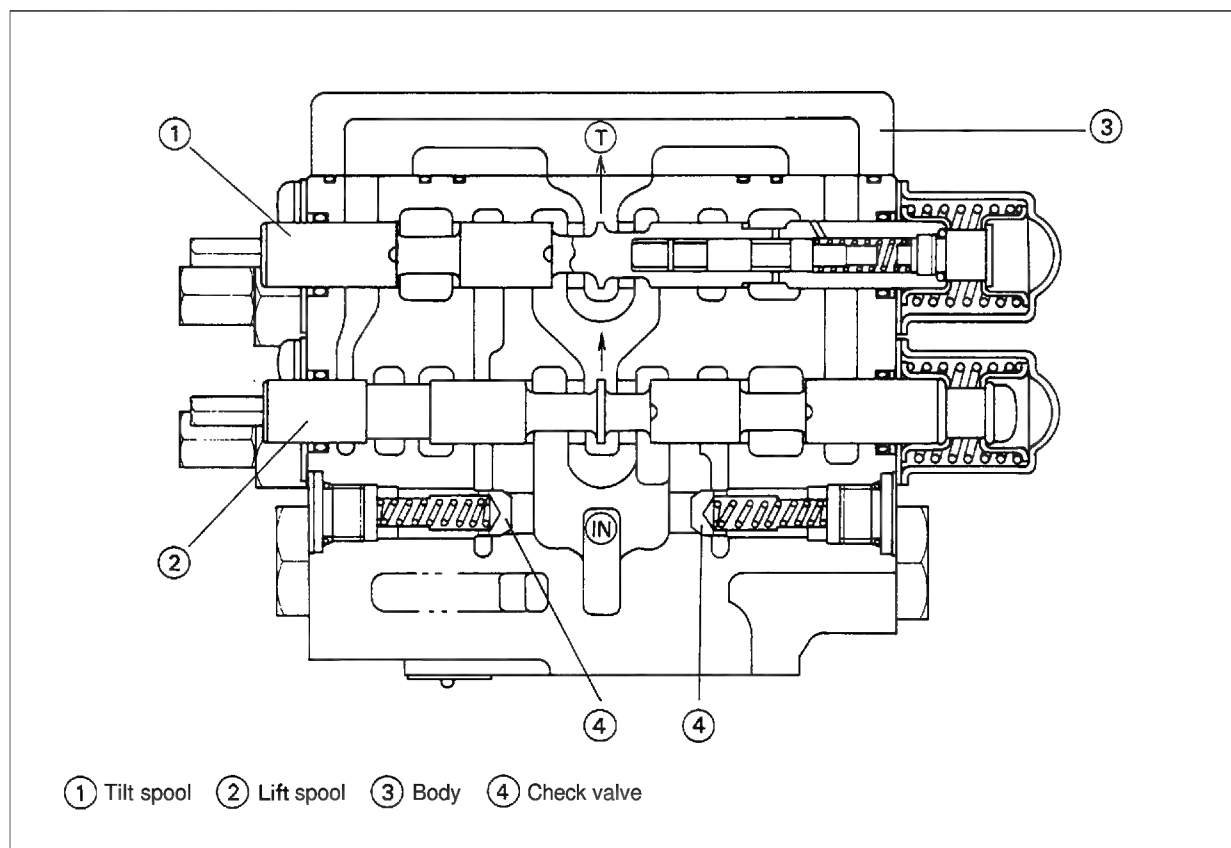
Vehicle type	Engine model	Oil pump type	Lifting speed mm/sec (f.p.m)	
			No load	Load
1.0—1.5 ton vehicle	4Y	KZP4-25C	580 (113.4)	550 (107)
	4P	KZP4-21C	580 (113.4)	540 (106)

OIL CONTROL VALVE

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INSPECTION	13-10
ASSEMBLY	13-11
INSTALLATION	13-13
ADJUSTMENT	13-14
OIL CONTROL VALVE LINK	13-15
COMPONENTS	13-15
DISASSEMBLY	13-16
INSPECTION	13-16
INSTALLATION	13-17

GENERAL

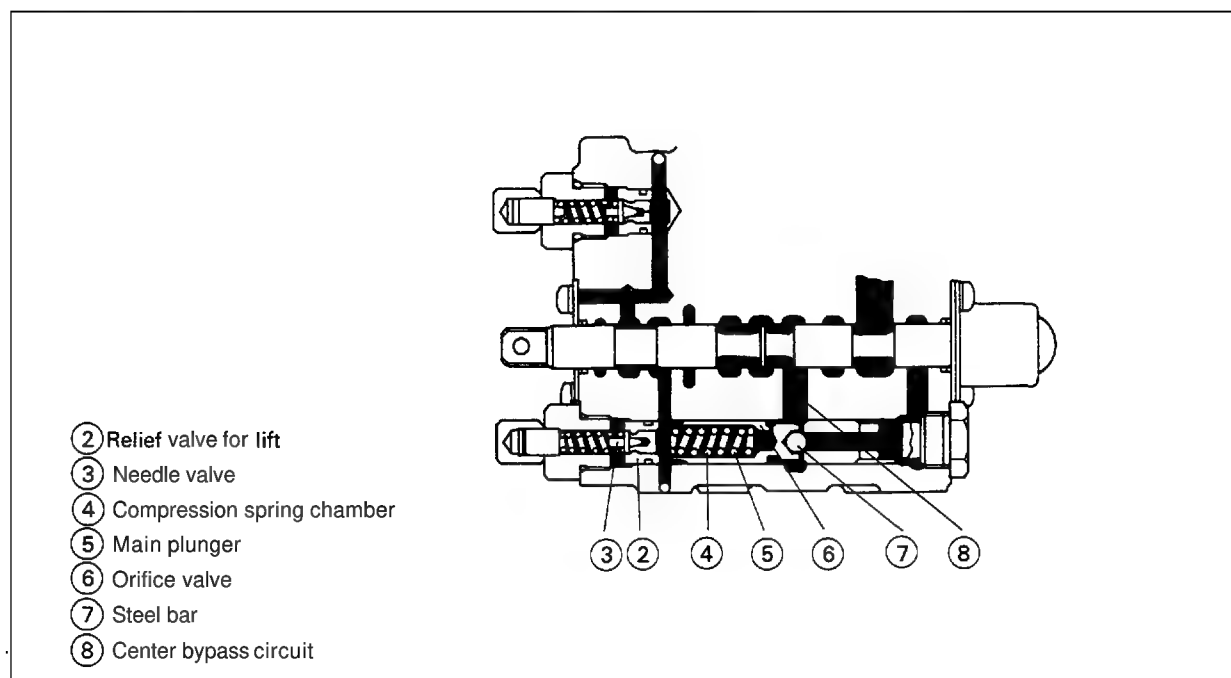
Oil Control Valve



Oil Control Valve Section (When in Neutral Point)

LAOM67

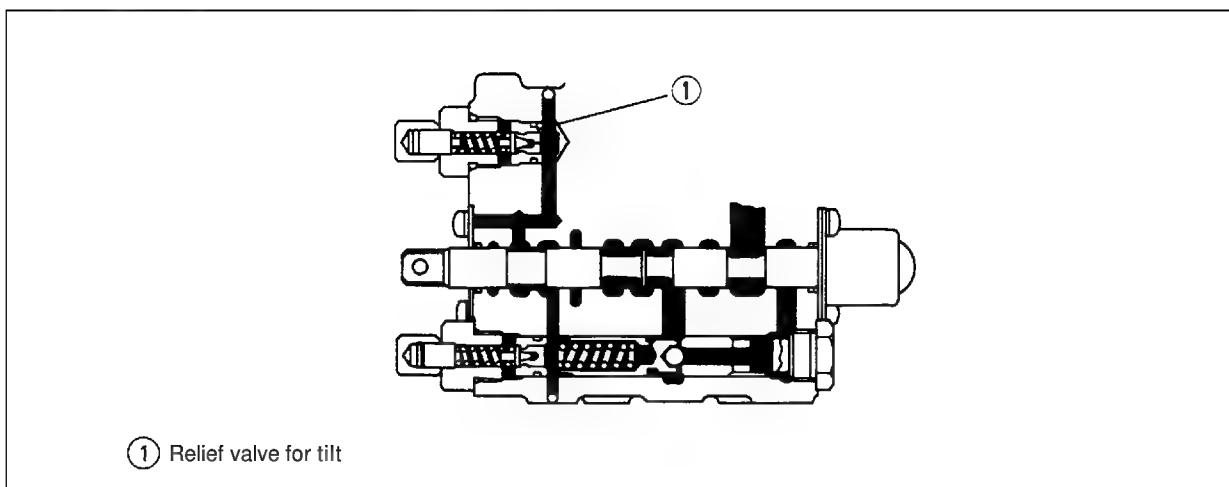
Relief Valve



Relief Valve Section

LAOS178

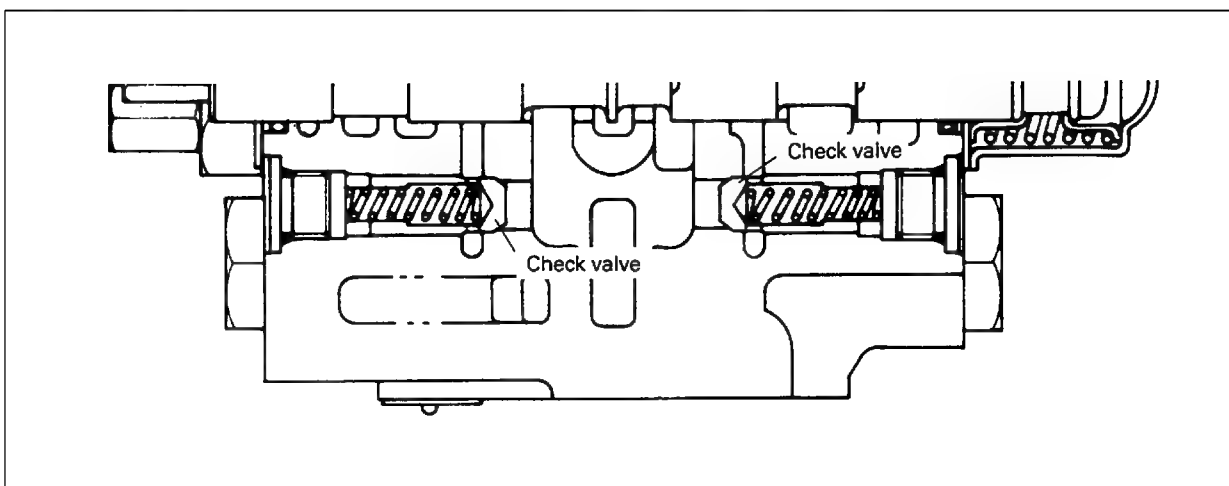
Relief Valve



Relief Valve Section (for Tilting)

LAOS178

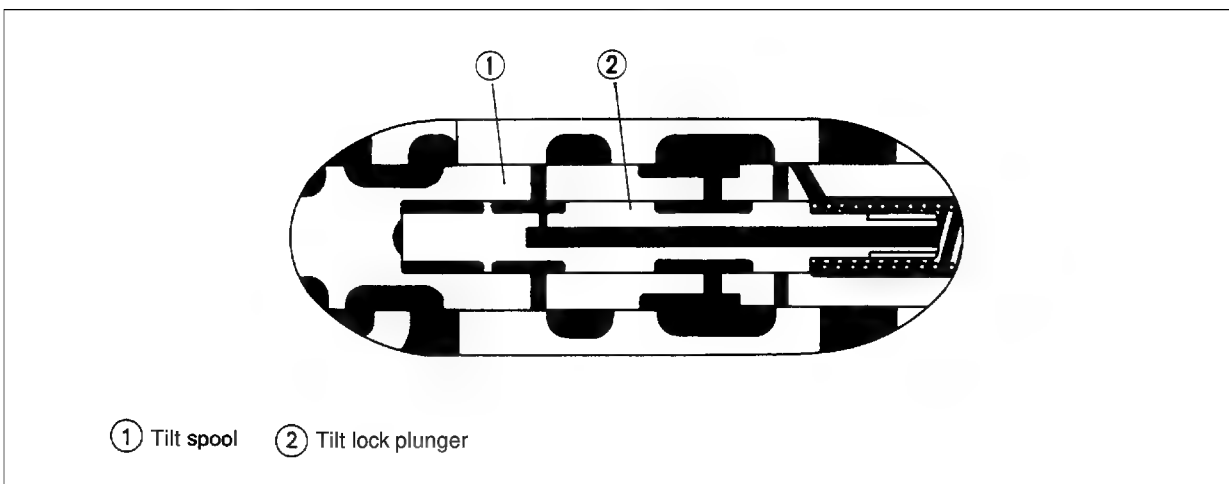
Check Valve



Check Valve Section

LAOM67

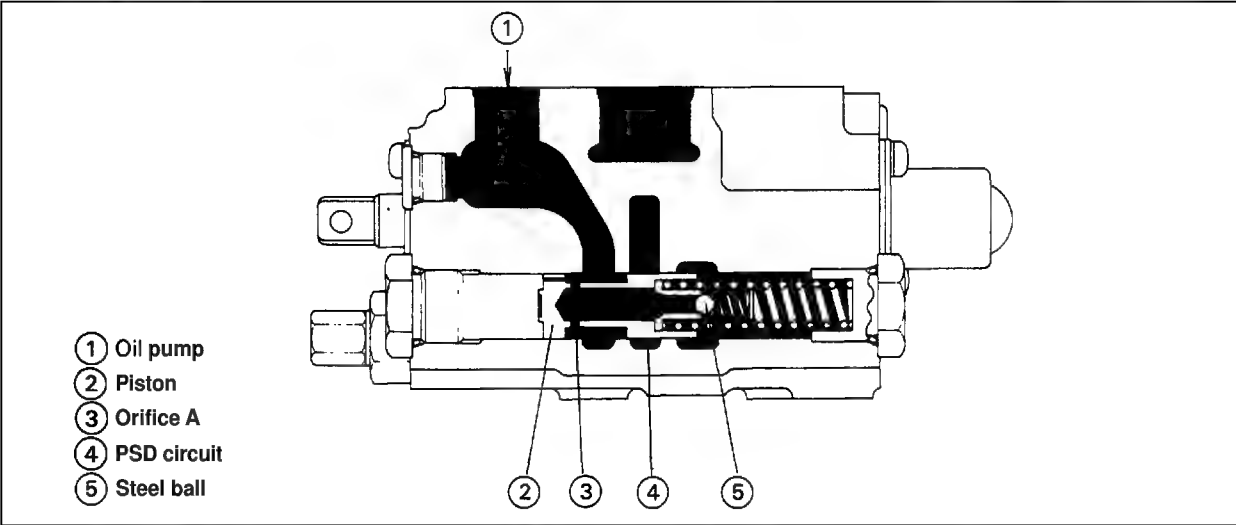
Tilt Lock Valve



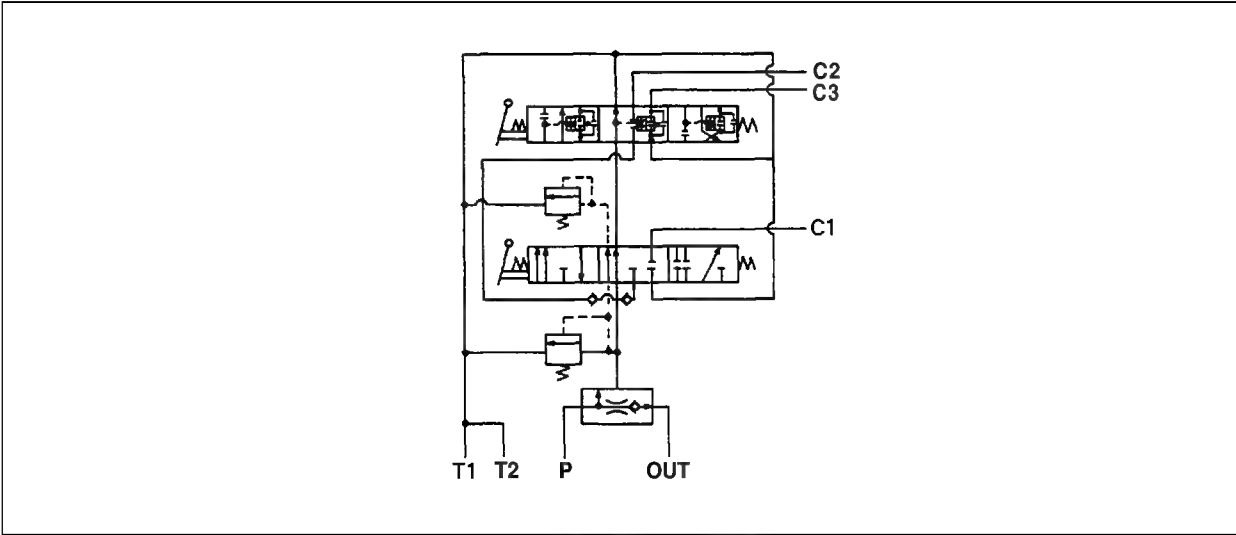
Tilt Lock Valve Section (When in Neutral Point)

LAOS182

Flow Divider



LAOM72



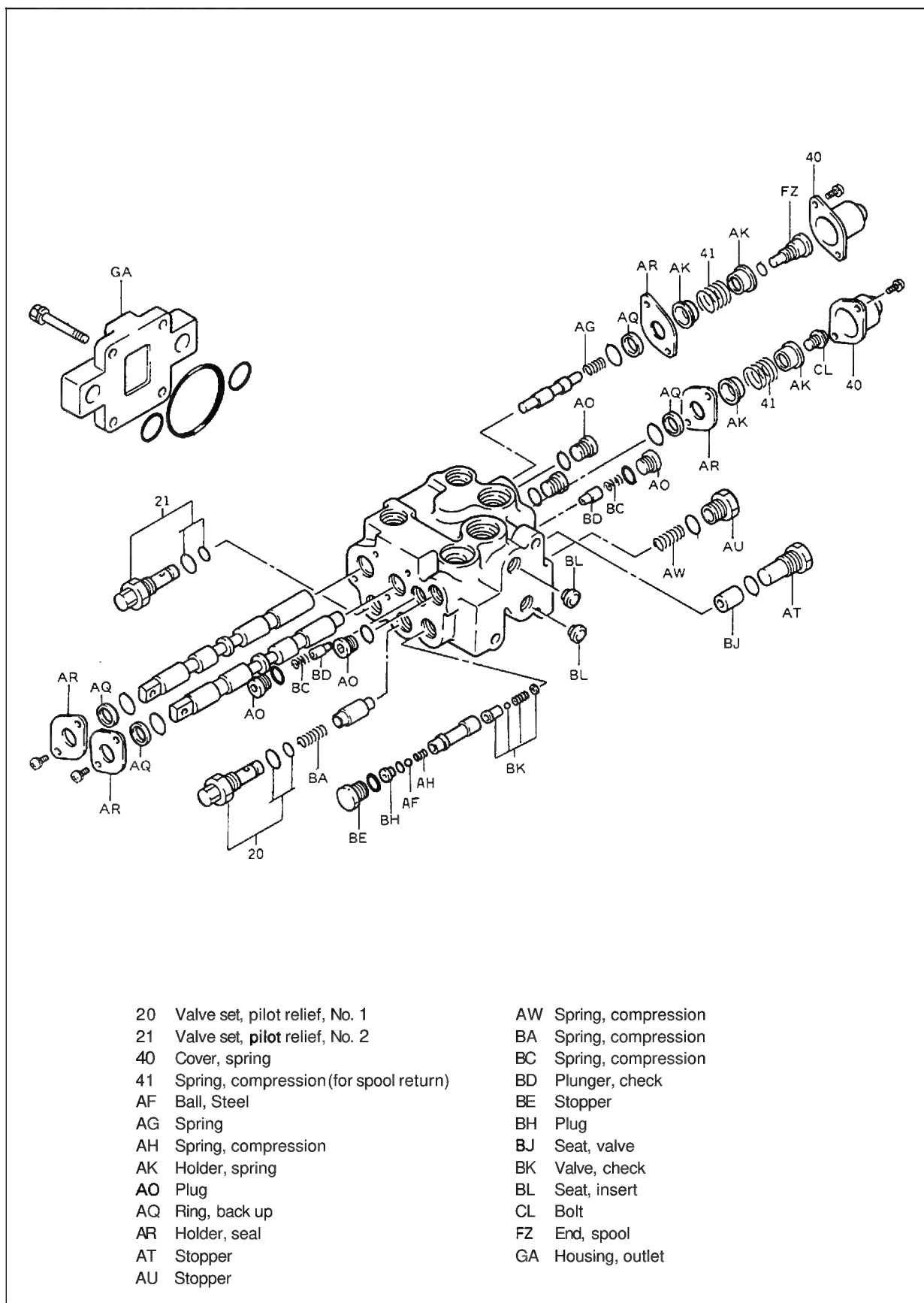
Hydraulic Pressure Circuit Diagram

LARS66

SPECIFICATIONS

Model		4P engine model	4Y engine model
Item			
Oil control valve type		Add-on type	←
Relief pressure kg/cm ² (psi)	Lift	140 (1990)	←
	Tilt	120 (1710)	←
Flow of flow divider	ℓ /min (USgal/min)	9.5 (2.51)	12.6 (3.33)
Others	Tilt lock valve integrated	←	
	Flow divider valve integrated	←	

COMPONENTS

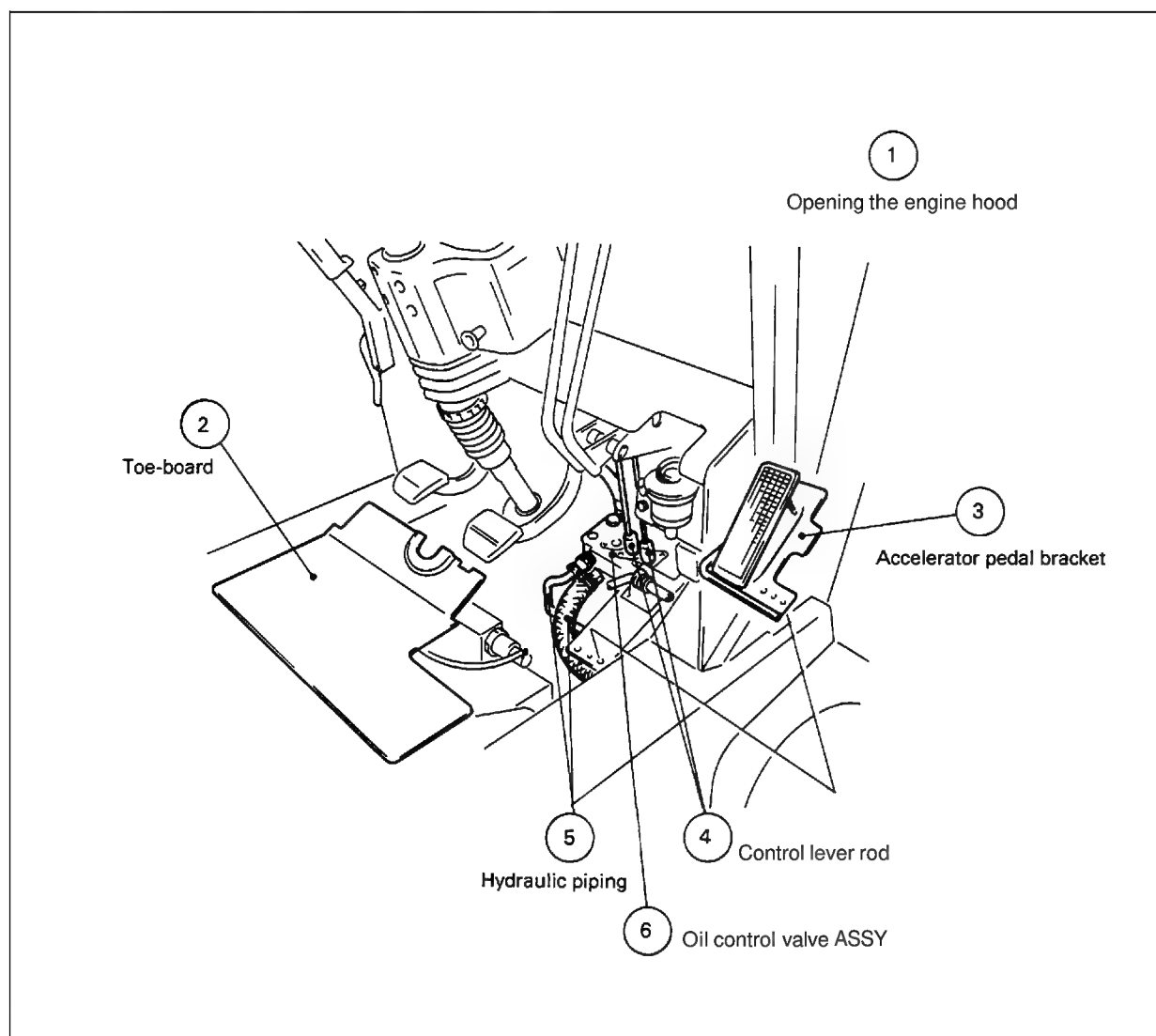


Oil Control Valve Component

LARM34

OIL CONTROL VALVE ASSY

REMOVAL



Oil Control Valve Removal

LARM79

Removing Process

1. Open the engine hood.
2. Remove the toe-board.
3. Remove the accelerator pedal and bracket
 - (1) Set bolts
 - (2) Accelerator pedal and bracket
4. Disconnect the lever rod SUB-ASSY.
 - (1) Cotter pin
 - (2) Plate washer
 - (3) Clevis pin
 - (4) Lever rod SUB-ASSY
5. Disconnect the hydraulic pipings.
 - (1) Load handling pipings
 - (2) Steering pipings
6. Remove the oil control valve
 - (1) Set bolts
 - (2) Return hose
 - (3) Oil control valve ASSY

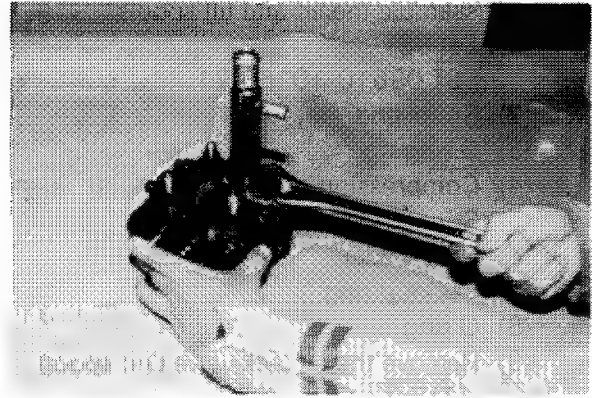
DISASSEMBLY

Caution:

- Do this job at a clean place.
- Since every component part is finished with high precision, be careful not to damage them during handling.

Remove the return elbow

- (1) Loosen the lock nut
- (2) Return elbow

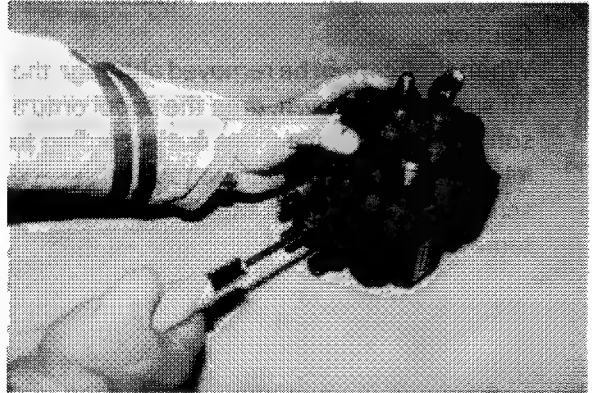


Removing the Elbow

LA036-2

Remove the seal holder

- (1) Set screw
- (2) Seal holder

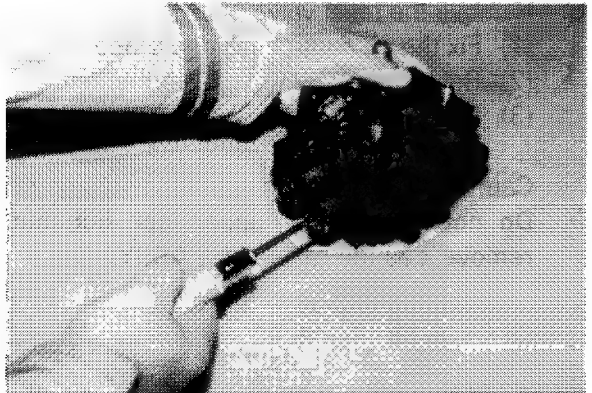


Removing the Seal Holder

LA036-5

3. Remove the spring cover

- (1) Set screw
- (2) Spring cover

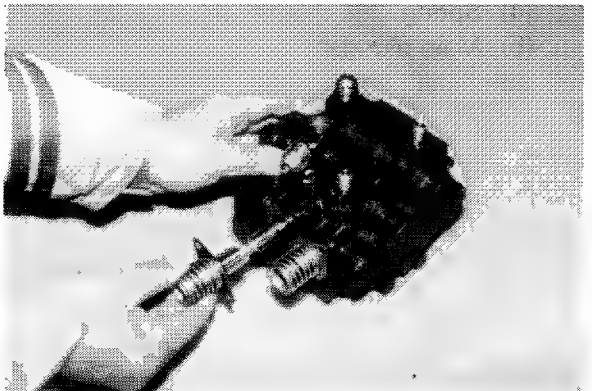


Removing the Spring Cover

LA036-7

4. Remove the spool

- (1) Lift spool and spring ASSY
- (2) Tilt spool and spring ASSY



Removing the Spool

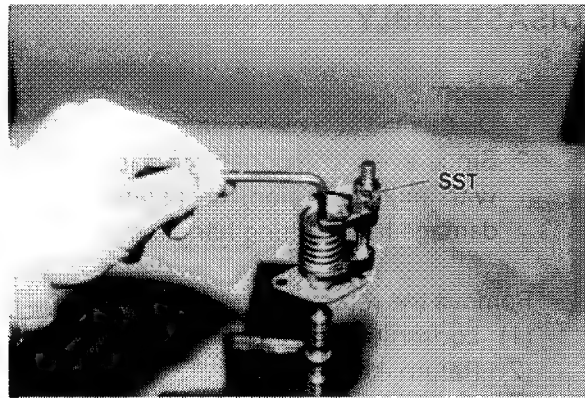
LA036-8

Disassemble the lift and tilt spools

- (1) Set SST
SST 09610-10160-71
- (2) Spool end
- (3) O ring
- (4) Compression spring
- (5) Spring holder
- (6) Seal holder
- (7) Back-up ring
- (8) O ring
- (9) Remove the tilt lock valve (Tilt spool)
 - ① Spring
 - ② Tilt lock valve

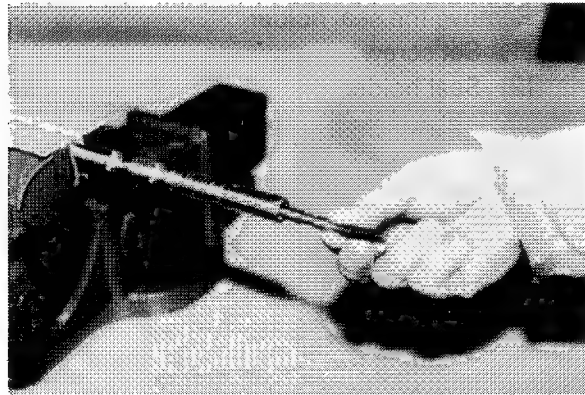
Caution:

When they cannot be removed although the tilt spool is laid down, drop the spool onto a soft material to take them out according to its reaction. In addition, attach a service screw (M6, P = 1.0) to the tilt lock valve for removal.



Disassembling the Spool

LA036-13



Removing the Tilt Lock Valve

LA036-28

Remove the relief valve

- (1) Fix the oil control valve in a vice.
- (2) Relief valve (Tilt)
- (3) Relief valve (Lift)

Caution:

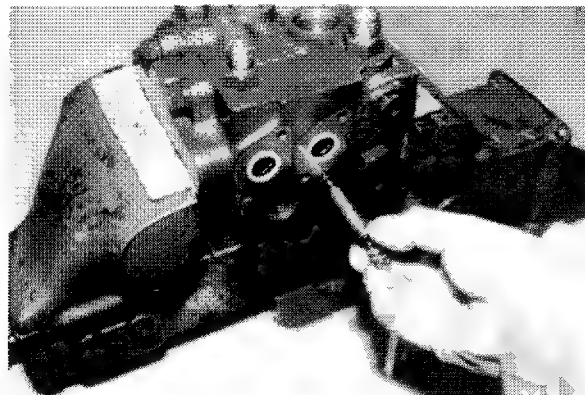
Do not remove the upper lock nut, but remove it as the relief valve ASSY.



Removing the Relief Valve

LA036-15

- (4) Spring
- (5) Main plunger



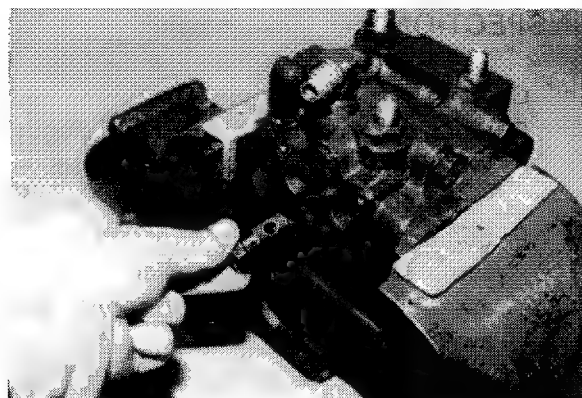
Removing the Main Plunger

LA036-17

- (6) Stopper
 - (7) Valve seat
- SST 09700-30200-71

Caution:

In removing the valve seat, strict care should be taken not to damage the plunger sliding section.



Removing the Valve Seat

LA036-18

Remove the flow divider valve

(Upper side)

(1) Stopper

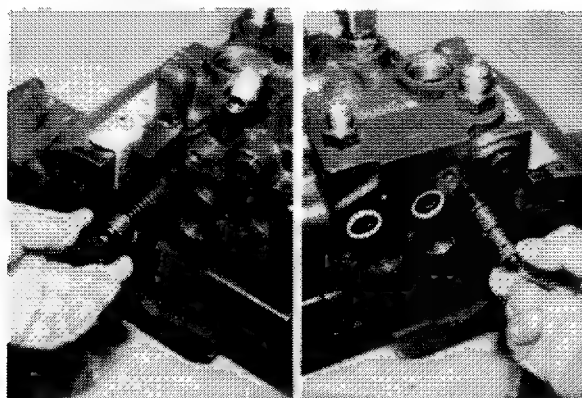
(2) Piston

(3) Check valve

(Lower side)

(1) Stopper

(2) Valve seat



Removing the Flow Divider Valve

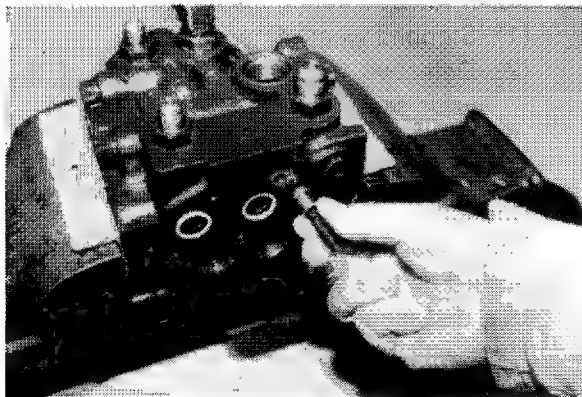
LA036-22.24

8. Remove the check plunger.

(1) Plug

(2) Spring

(3) Check plunger



Removing the Check Plunger

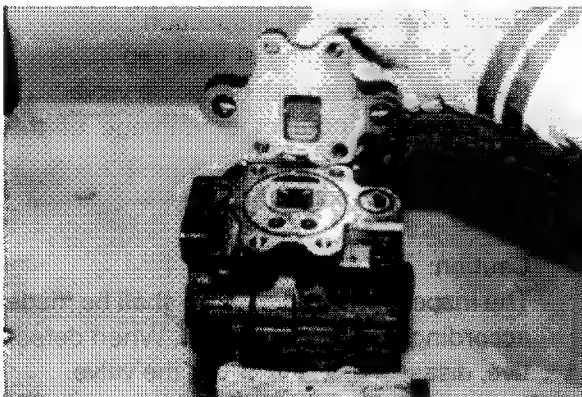
LA036-27

9. Remove the outlet housing.

(1) Set bolt

(2) Outlet housing

(3) O ring



Removing the Outlet Housing

LA036-31

INSPECTION

Caution:

- Clean every component part sufficiently. When any of them is found defective, repair or replace it.
- Some of these parts, although disassembled, have to be replaced as an assembly, since there is no service part available as a unit.

Body and outlet housing inspection

- (1) Damage of the sliding section of each spool
- (2) Stepped wear of the check valve seat section
- (3) Damage of each elbow and cap

2. Spool inspection

- (1) Damage or deformation of the lift spool
- (2) Damage or deformation of the tilt spool

Caution:

In the spool wear check, make **good/no good** decision according to the oil leak test.

Relief valve for lifting inspection

- (1) Stepped wear of needle valve
- (2) Defective contact or damage of the valve seat
- (3) Damage of spring

Caution:

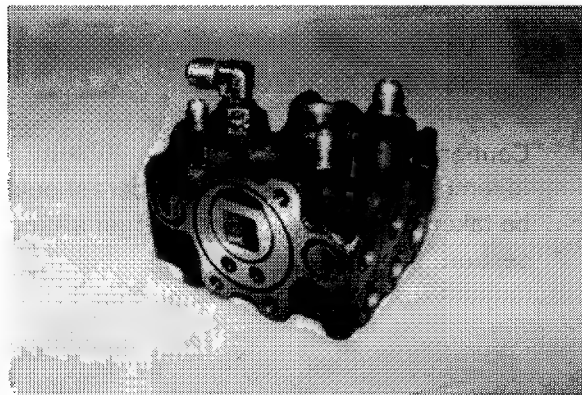
The inspection of relief valve shall be made according to a hydraulic test. When defective, disassemble and check the valve.

Relief valve for tilting inspection

- (1) Stain or clogging of filter cap
- (2) Stepped worn out of needle valve
- (3) Defective contact or damage of the valve seat
- (4) Fatigue of spring

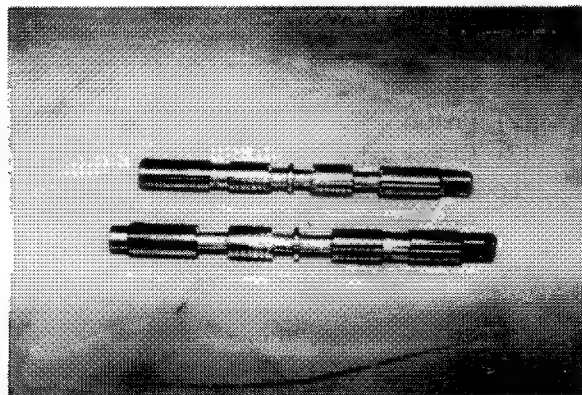
Caution:

The inspection of relief valve shall be made according to a hydraulic test. When defective, disassemble and check the valve.



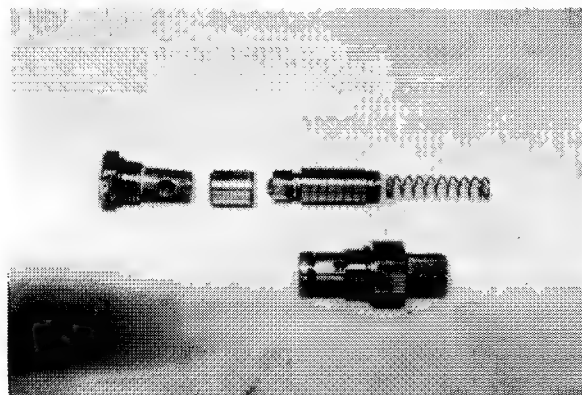
Inspecting the Body

LA036-32



Inspecting the Spool

LA036-33



Inspecting the Relief Valve

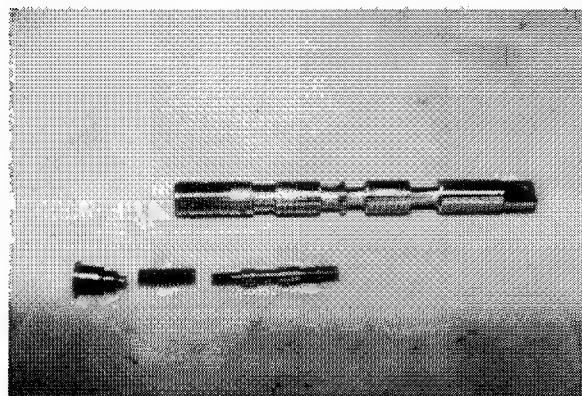
LA036-35



Inspecting the Relief Valve

LA036-36

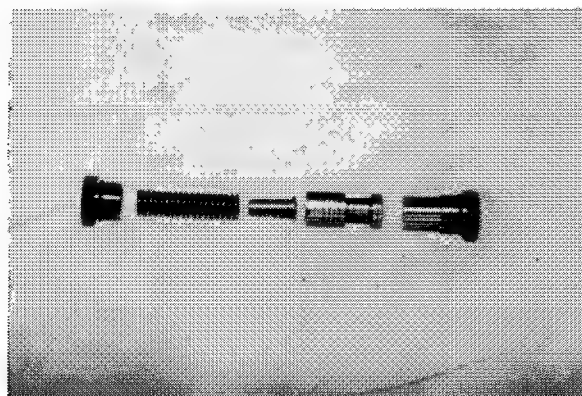
5. Tilt lock valve inspection
 - (1) Sliding conditions of the tilt lock plunger
 - (2) Breakage or fatigue of spring



Inspecting the Tilt Lock Valve

LA039-2

6. Flow divider valve inspection
 - (1) Sliding conditions of piston
 - (2) Damage of check valve
 - (3) Breakage or fatigue of spring

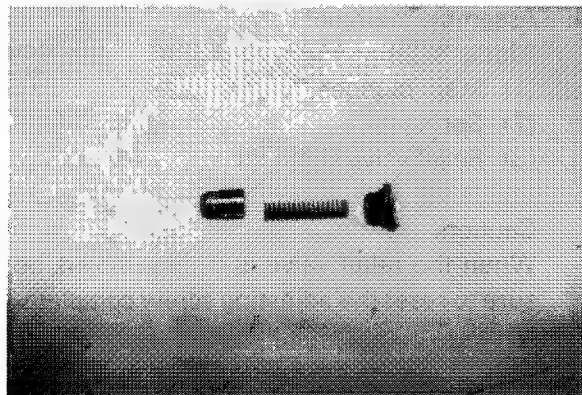


Inspecting the Flow Divider Valve

LA039-3

Check valve inspection

- (1) Stepped wear of the check plunger
- (2) Breakage or fatigue of spring



Inspecting the Check Valve

LA039-4

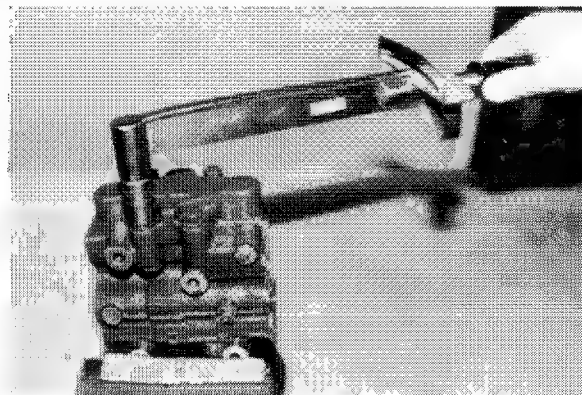
ASSEMBLY

Caution:

Clean every component part sufficiently, blow them with compressed air, apply hydraulic oil to them, and then assemble them.

Assemble the outlet housing

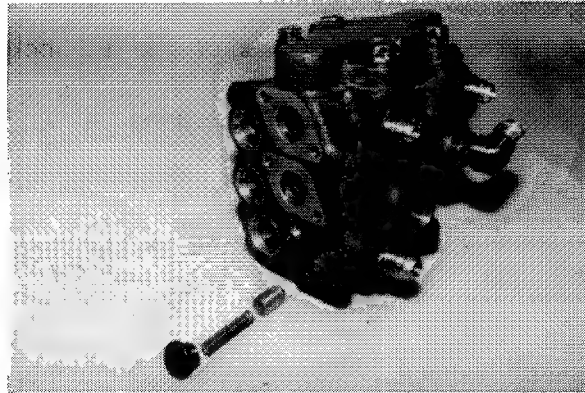
- (1) O ring
- (2) Outlet housing
- (3) Set bolts
 $T = 3.5 \sim 4.5 \text{ kg-m}$
 $(25.17 \sim 32.49 \text{ ft-lb})$



Assembling the Outlet Housing

LA039-8

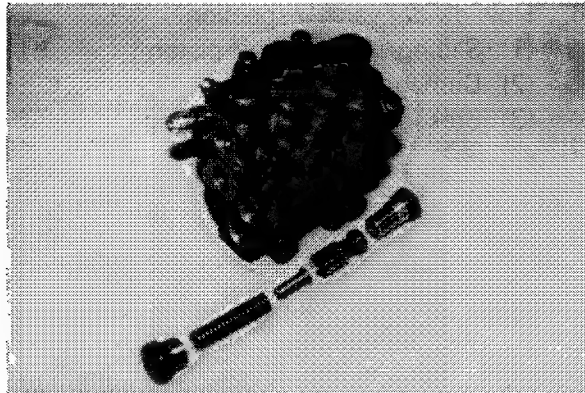
2. Assemble the check plunger
 - (1) Check plunger
 - (2) Spring
 - (3) Plug



Assembling the Check Plunger

LA039-9

3. Assemble the flow divider valve
 - (Upper side)
 - (1) Checkvalve
 - (2) Piston
 - (3) Stopper
 - (Lower side)
 - (1) Valve seat
 - (2) Stopper



Assembling the Divider Valve

LA039-10

4. Assemble the relief valve
 - (Upper side)
 - (1) Main plunger
 - (2) Spring
 - (3) Relief valve (Tilt, Lift)

Caution:

When the relief valve is disassembled, be sure to reset the adjusting screw completely.

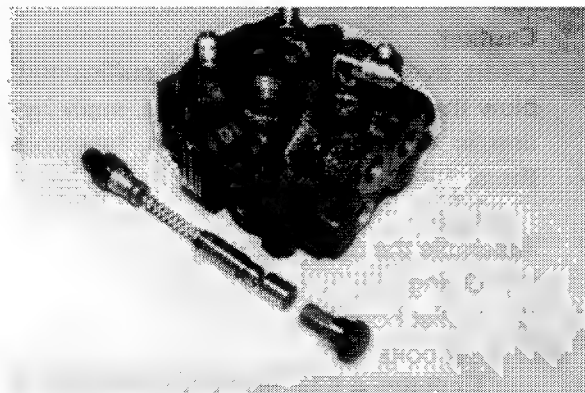
(Lower side)

- (1) Valve seat
SST 09700-30200-7 1
- (2) Stopper



Resetting the Adjusting Screw

LA036-34

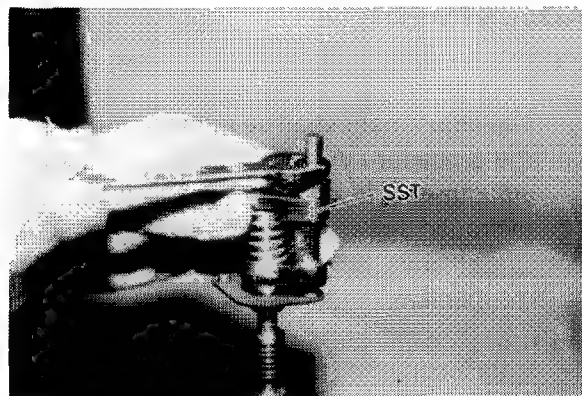


Assembling the Relief Valve

LA039-13

5. Assemble the lift and tilt spools
 - (1) Assemble the tilt lock valve (Tilt spool)
 - ① Tilt lock valve
 - ② Spring
 - (2) O ring
 - (3) Back-up ring
 - (4) Seal holder
 - (5) Spring holder
 - (6) Compression spring
 - (7) O ring
 - (8) Set SST

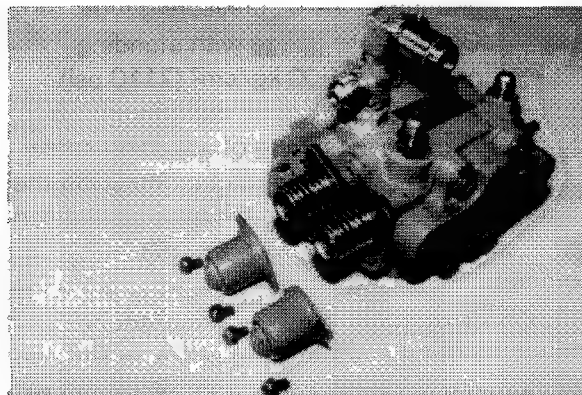
SST 09610-10160-71
 - (9) Spool end



Assembling the Spring

LA039-18

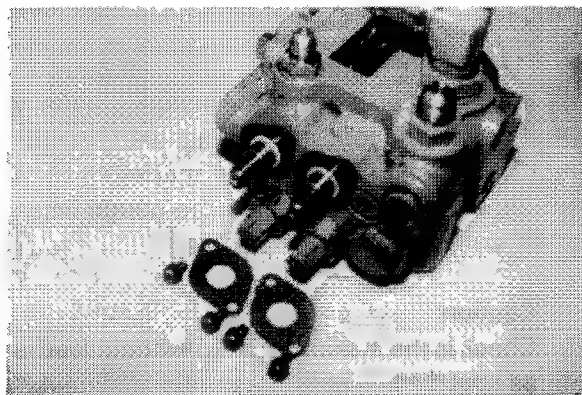
6. Assemble the spool
 - (1) Lift spool and spring ASSY
 - (2) Tilt spool and spring ASSY
7. Assemble the spring cover
 - (1) Spring cover
 - (2) Set screw



Assembling the Spring Cover

LA037-6

8. Assemble the seal holder
 - (1) Seal holder
 - (2) Set screw
9. Assemble the return elbow
 - (1) Return elbow
 - (2) Lock nut



Assembling the Seal Holder

LA037-7

INSTALLATION

The installation procedure is the reverse of the disassembly procedure.

Caution:

- Install the toe board after adjustment.
- Apply the chassis grease to link parts of the oil control valve lever.
- Check the amount of hydraulic oil. When it is insufficient, add the oil up to the specified level.

ADJUSTMENT

Caution:

The adjustment shall be made according to the procedure described below. A random adjustment, if made, might damage the hydraulic devices of the oil pump, etc., due to defective adjustment in the hydraulic mechanism.

1. Installation of oil pressure gauge
 - (1) Remove the plug (9/16-18UNF-20) on the upper part of the oil control valve and install the oil pressure gauge.

Oil pressure gauge with standing pressure: 500 kg/cm² (7110 psi)

Check of the loosening of adjusting screw

- (1) Remove the ball head lock nut on the upper part of the relief valve and loosen the adjusting screw.

Check of oil leak and abnormal sound

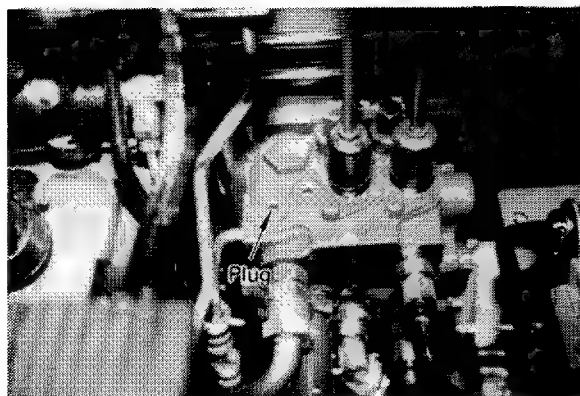
- (1) Start the engine and check to see that oil is not leaking and no abnormal sound is generated.

Adjustment of oil pressure

- (1) Set the control lever to the lift position and then tighten the screw gradually until the fork starts lifting.
- (2) Run the engine at the maximum RPM and read the oil pressure gauge when the fork is at its upper limit.

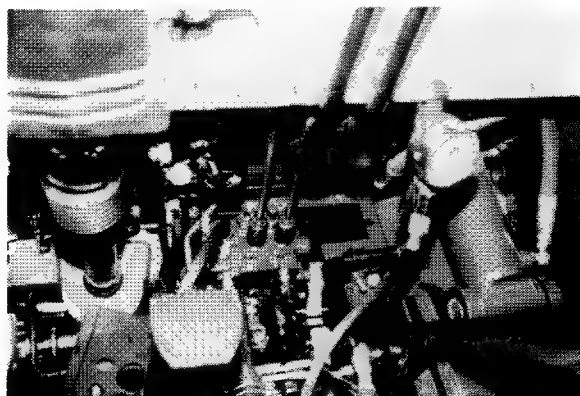
Caution:

Check is the maximum RPM without load is as specified.



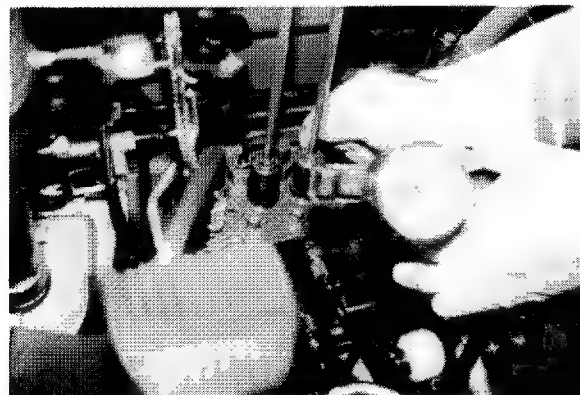
Oil Pressure Gauge Installing Position

LA024-27



Measuring the Oil Pressure

LA024-26



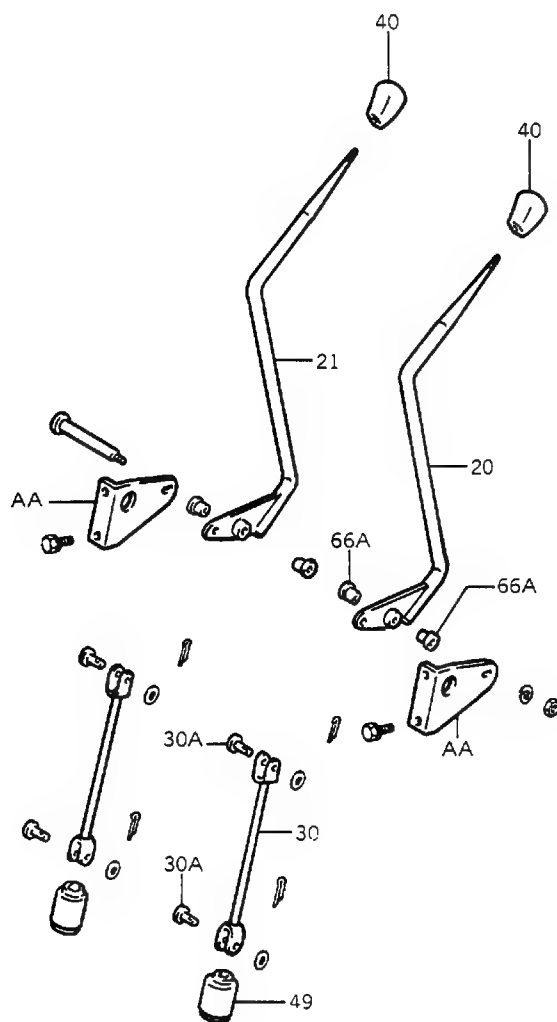
Adjusting the Oil Pressure

LA024-22

- (3) Set the control lever at the backward tilt position and tighten the adjusting screw gradually until the mast starts tilting backward.
- (4) Run the engine at the maximum RPM and read the oil pressure gauge when the fork is tilted fully backward. Adjust the oil pressure with the adjusting screw so that it becomes normal.
- (5) After the oil pressure adjustment, insert the packing, tighten it with a ball head lock nut, and then check the oil pressure again.
- (6) Remove the oil pressure gauge and fit the plug securely. Then, install the toe board and close the engine hood.

OIL CONTROL VALVE LINK

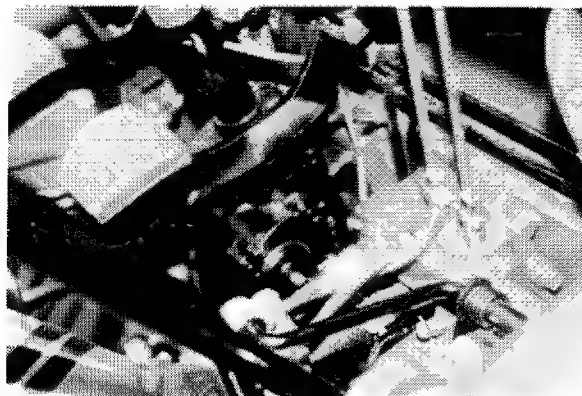
COMPONENTS



- | | | | |
|-----|--|-----|---------------------------------|
| 20 | Lever SUB-ASSY, control valve No. 1 | 41 | Pin, control valve lever |
| 21 | Lever SUB-ASSY, control valve No. 2 | 41A | Bush |
| 22 | Lever SUB-ASSY, control valve No. 3 | 48 | Boot, control valve link, No. 1 |
| 23 | Lever SUB-ASSY, control valve No. 4 | 49 | Boot, control valve link, No. 2 |
| 30 | Rod SUB-ASSY, control valve lever, No. 1 | 50 | Turnbuckle |
| 30A | Pin | AA | Bracket SUB-ASSY |
| 31 | Rod SUB-ASSY, control valve lever, No. 2 | AC | Nut |
| 40 | Knob, oil control valve lever | AW | Bolt |

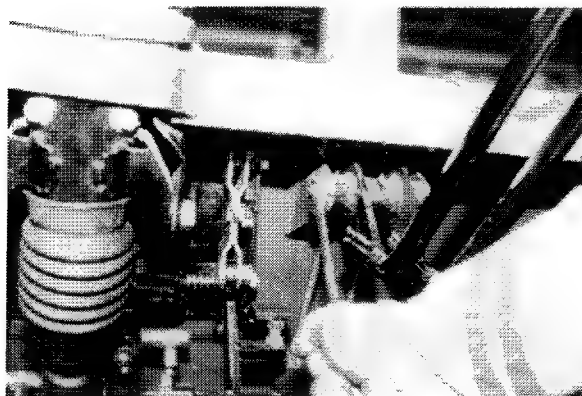
DISASSEMBLY

1. Open the engine hood
2. Remove the toe-board
3. Disconnect the lever rod SUB-ASSY
 - (1) Rubber
 - (2) Cotter pin
 - (3) Pin
 - (4) Lever rod
4. Remove the control lever SUB-ASSY
 - (1) Set nuts
 - (2) Set bolts
 - (3) Control lever rod SUB-ASSY



Disconnecting the Lever Rod

LA049-26



Disconnecting the Lever Rod SUB-ASSY

LA038-18

- (4) Cotter pin
- (5) Pin
- (6) Lever rod
- (7) Link boot

Caution:

Disconnect the boot and rod only when they are defective.



Disconnecting the Lever Rod

LA038-19

INSPECTION

Caution:

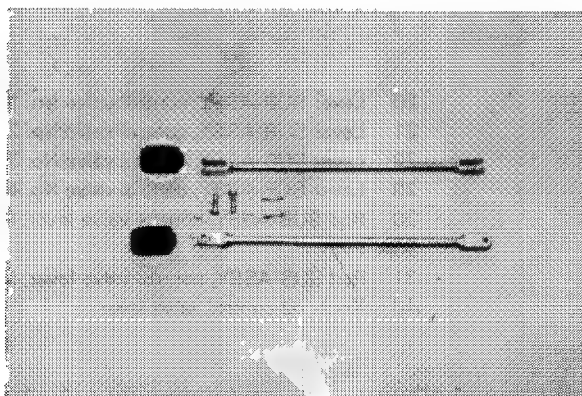
If any part is found defective, repair or replace it.

Lever and SUB-ASSY inspection

- (1) Bending, damage, or deformation of rod
- (2) Wear or damage of pins and pin joint sections
- (3) Damage or aging of boot

Control lever SUB-ASSY inspection

- (1) Bending, damage, or deformation of lever



Inspecting the Rod Related Parts

LA038-22

- (2) Damage of screw sections
- (3) Wear or damage of pins and pin joint sections
- (4) Wear, damage, or deformation of bush
- (5) Damage of set bolts
- (6) Damage of deformation of knob

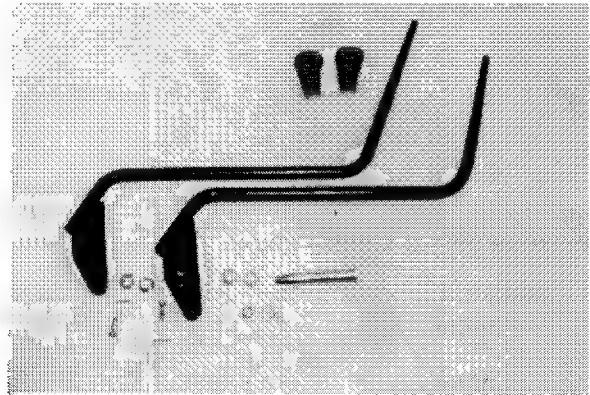
INSTALLATION

1. Control lever SUB-ASSY installation.

- (1) Link boot
- (2) Lever rod
- (3) Pin
- (4) Cotter pin
- (5) Control lever rod SUB-ASSY
- (6) Set bolts
- (7) Set nuts

Caution:

If assembled with the lever kept lowered, the rod enters in the clearance between the brake pipe and protector, this disabling the assembly.



Inspecting the Lever Related Parts

LA038-23



Assembling the Rod SUB-ASSY

LA038-25



Assembling the Lever SUB-ASSY

LA038-27

2. Lever rod SUB-ASSY installation

- (1) Lever rod
- (2) Pin
- (3) Cotter pin
- (4) Rubber

3. Toe-board installation

4. Shut the engine hood.

5. Functional check of control lever

- (1) Grip the knob to check the working of knob.



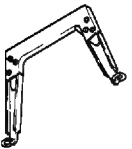

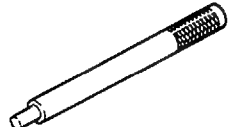
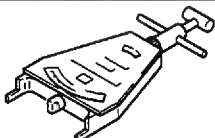
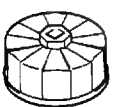
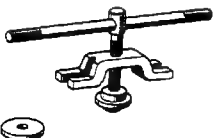
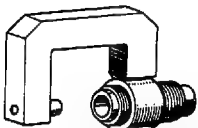

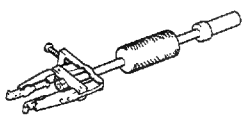
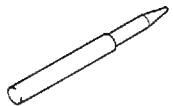
Assembling the Rod SUB-ASSY



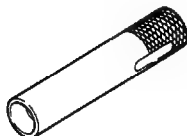
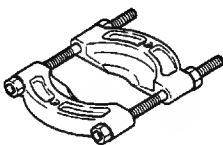
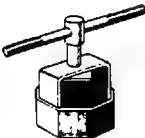
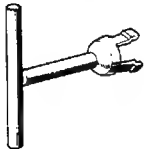
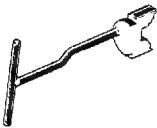
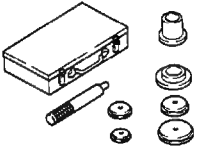
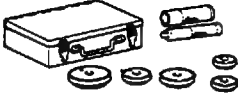
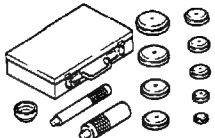
LA049-32

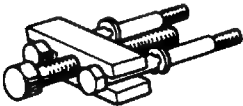
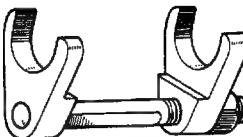
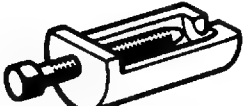
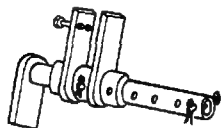
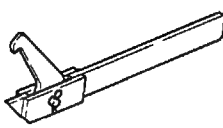
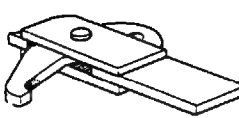
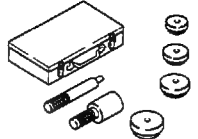


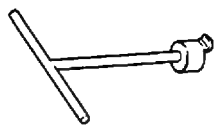
APPENDIX

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SST LIST

SST Description Section			1	2	3	4	5	6	7	10	11	12	13
SST Part Name													
SST Part Number													
SST													
	09010-20111-71	Hunger, engine	○	○									
	09110-30200-71	Remover & replacer, counter shaft					○						
	09160-10170-71	Remover & replacer, bar				○							
	09216-00020	Belt tension gauge	○										
	09228-07500	Wrench, oil filter		○									
	09310-10160-71	Remover, front axle hub				○							
	09310-22000-71	Remover, reamer bolt				○							
	09320-10410-71	Replacer, front hub inner bearing				○							
	09320-23000-71	Remover, bearing		○									
	09360-10410-71	Replacer, front axle bracket set bolt				○							

SST Description Section			1	2	3	4	5	6	7	10	11	12	13
SST Part Name													
SST Part Number													
SST													
	09370-10410-71	Replacer, front axle bearing				○							
	09370-20270-71	Replacer, drive pinion bearing			○		○			○			
	09411-41800-71	Replacer, second shaft dust seal		○				○					
	09420-23000-71	Remover, bearing			○								
	09509-55020	Wrench, rear wheel bearing				○							
	09510-10170-71	Remover and replacer, brake hold down spring							○				
	09510-31960-71	Remover and replacer, brake hold down spring							○				
	09608-12010	Replacer set, front hub & drive pinion bearing		○									
	09608-30012	Tool set, front hub & drive pinion bearing		○	○								
	09608-35014	Tool set, axle hub & drive pinion bearing		○	○	○							

SST Description Section			1	2	3	4	5	6	7	10	11	12	13
SST Part Name													
SST Part Number													
SST													
	09609-200111	Puller, steering wheel						○					
	09610-10160-71	Remover & replacer, oil control valve spring											○
	09610-20012	Puller, pitman arm					○						
	09610-22000-71	Stopper assy, inner mast							○	○			
	09620-10100-71	Remover & replacer, cylinder cap					○						
	09620-10160-71	Remover & replacer, cylinder cap									○		
	09620-30010	Replacer, steering gear box					○					○	
	09630-10110-71	Remover & replacer, tilt cylinder cap			○								
	09700-30200-71	Remover, spring pin tool			○			○					○
	09717-20010	Remover, brake shoe return spring							○				





SST Description Section			1	2	3	4	5	6	7	10	11	12	13
SST Part Name													
SST Part Number													
SST													
	09718-20010	Replacer, brake shoe return spring							O				
	09810-20172-71	Remover, joint pin								O	O		
	09905-00012	Expander, snap ring No.						O					
	09950-20017	Puller, universal		O	O		O			O	O		

TABLE OF SERVICE STANDARDS

TORQUE CONVERTER

Stall speed (4Y engine vehicle)	rpm	Standard	1850
(4P engine vehicle)	rpm	Standard	2050
Torque converter oil pressure (main pressure)	kg/cm ² (psi)	Standard	8 — 12 (113.6 ~ 170.4)
Torque converter internal oil pressure (outlet pressure)	kg/cm ² (psi)	Standard	0.5 ~ 3.5 (7.1 ~ 49.7)
Torque converter oil amount	ℓ (US gal)	Standard	9.5 (2.5)
Torque converter & transmission			
Free length of spring in inching spool	mm (in)	Standard	73 (2.87)
Free length of spring in inching spool	mm (in)	Limit	65.7 (2.59)
Free length of accumulator spring	mm (in)	Standard	119.6 (4.71)
Free length of accumulator spring	mm (in)	Limit	107.5 (4.23)
Free length of regulator valve spring (big diameter side)	mm (in)	Standard	135.3 (5.33)
Free length of regulator valve spring (big diameter side)	mm (in)	Limit	1.21 (4.76)
Free length of regulator valve spring (small diameter side)	mm (in)	Standard	123.7 (4.87)
Free length of regulator valve spring (small diameter side)	mm (in)	Limit	111 (4.37)
Free length of detent spring	mm (in)	Standard	73.9 (2.91)
Free length of detent spring	mm (in)	Limit	66.5 (2.62)
Stator roller outside diameter	mm (in)	Standard	8.2 (0.3228)
Stator roller outside diameter	mm (in)	Limit	8.05 (0.3169)
Stator hub to cam clearance	mm (in)	Standard	0.08—0.119 (0.00315—0.00220)
Stator hub to cam clearance	mm (in)	Standard	0.15 (0.00591)
Extension boss in sliding contact with oil seal	mm (in)	Standard	70 (2.756)
Extension boss in sliding contact with oil seal	mm (in)	Limit	69.8 (2.748)
Extension boss to seal ring clearance	mm (in)	Limit	0.3 (0.0118)
Outside diameter of stator shaft in sliding contact with oil pump gear bushing	mm (in)	Standard	55 (2.165)
Outside diameter of stator shaft in sliding contact with oil pump gear bushing	mm (in)	Limit	54.8 (2.157)
Driven gear to pump body clearance	mm (in)	Standard	0.12—0.2 (0.00472— 0.00787)
Driven gear to pump body clearance	mm (in)	Limit	0.3 (0.0118)
Driven gear to crescent clearance	mm (in)	Limit	0.4 (0.0157)

Drive gear to crescent clearance	mm (in)	Limit	0.25 (0.00984)
Pump drive gear bushing to stator shaft clearance	mm (in)	Standard	0.03 — 0.079 (0.001181 — 0.00311)
Pump drive gear bushing to stator shaft clearance	mm (in)	Limit	0.15 (0.00591)
Pump body surface to seal ring clearance	mm (in)	Standard	0.06 — 0.08 (0.00236 — 0.00315)
Pump body surface to drive/driven gear clearance	mm (in)	Limit	0.12 (0.00472)
Main shaft servo portion seal ring thrust clearance	mm (in)	Limit	0.3 (0.0118)
Free length of clutch return spring	mm (in)	Standard	51 (2.008)
Free length of clutch return spring	mm (in)	Limit	46 (1.81)
Clutch piston ring thrust clearance	mm (in)	Limit	0.15 (0.0059)
Pressure plate thickness	mm (in)	Standard	4.0 (0.157)
Pressure plate thickness	mm (in)	Limit	3.8 (0.15)
Clutch camber plate deflection (flexure)	mm (in)	Free height	2.6 (0.102)
Clutch camber plate deflection (flexure)	mm (in)	Limit	2.2 (0.087)
Clutch drive plate (clutch disc) thickness	mm (in)	Standard	2.6 (0.102)
Clutch drive plate (clutch disc) thickness	mm (in)	Limit	2.4 (0.094)
Clutch driven plate (clutch plate) thickness	mm (in)	Standard	1.6 (0.063)
Clutch driven plate (clutch plate) thickness	mm (in)	Limit	1.4 (0.055)
Clearance between clutch camber plate and snap ring	mm (in)	Standard	1.0 ~ 1.5 (0.0394 ~ 0.059)
Tightening torques			
Extension set bolt	kg-m (ft- b)	Standard	1.2 (8.67)
Stator shaft and pump case set bolt	kg-m (ft-lb)	Standard	1.9 — 2.5 (13.7 — 18.0)
Drive cover set bolt	kg-m (ft-lb)	Standard	2.5 (18.0)
Output shaft lock nut	kg-m (ft-lb)	Standard	35 ~ 40 (253 — 289)
Countershaft set bolt	kg-m (ft-lb)	Standard	1.9 ~ 2.5 (13.7 ~ 18.0)
Output shaft bearing retainer set bolt	kg-m (ft-lb)	Standard	7 ~ 8 (50.6 — 57.8)
Transmission case set bolt	kg-m (ft-lb)	Standard	8 (57.8)
Oil screen set bolt	kg-m (ft-lb)	Standard	1.9 — 2.5 (13.7 ~ 18.0)
Control valve set bolt	kg-m (ft-lb)	Standard	1.9 ~ 2.5 (13.7 ~ 18.0)

DIFFERENTIAL

Differential			
Rear face runout	mm (in.)	Limit value	0.1 (0.004)
Ring gear backlash	mm (in.)	Limit value	0.2 — 0.3 (0.008 — 0.012)
Side bearing starting force (w/differential) (output gear)	kg (lb.)	Standard	15.7 — 18.8 (34.5 — 41.4)
Differential gear backlash	mm (in.)	Limit value	0.2 — 0.3 (0.008 — 0.012)
Drive pinion bearing preload	kg (lb.)	Standard	13.8 — 16.9 (30.4 — 37.2)
Side gear thrust washer thickness	mm (in.)	Standard	1.6 (0.063)
	mm (in.)	Limit value	1.0 (0.039)
Spider outside diameter	mm (in.)	Standard	22.00 (0.866)
	mm (in.)	Limit value	21.75 (0.856)
Pinion thrust washer thickness	mm (in.)	Standard	1.6 (0.063)
	mm (in.)	Limit value	1.0 (0.039)
Differential pinion inside diameter	mm (in.)	Standard	22.12 (0.871)
	mm (in.)	Limit value	22.22 (0.875)
Thrust screw cap thickness	mm (in.)	Standard	13.0 (0.512)
	mm (in.)	Limit value	12.2 (0.480)
Tightening torque			
Ring gear set bolt	kg-m (ft-lb)	Standard	13 — 18 (94 — 130)
Differential upper case set bolt	kg-m (ft-lb)	Standard	4.4 — 5.5 (31.8 — 39.7)'
Output gear set nut	kg-m (ft-lb)	Standard	35 — 40 (253 — 289)
Drive pinion retainer set bolt	kg-m (ft-lb)	Standard	7 — 8 (50.6 — 57.8)
Bearing cap set bolt	kg-m (ft-lb)	Standard	12 — 14 (86.8 — 101.2)
Thrust screw lock nut	kg-m (ft-lb)	Standard	10.5 — 13 (75.9 — 94.0)

FRONT AXLE

Tightening torque			
Bearing lock nut stopper bolt	kg-m (ft-lb)	Standard	1.5 — 2.2 (10.8 — 16.0)
Axle shaft set nut	kg-m (ft-lb)	Standard	4 — 4.5 (28.9 — 39.8)
Front wheel hub nut	kg-m (ft-lb)	Standard	11 — 20 (79.5 — 144.6)
Front axle housing bracket set bolt	kg-m (ft-lb)	Standard	16 — 22 (115.7 — 159.0)

REAR AXLE

Rear axle			
Toe-in	mm (in.)	Standard	0 (0)
Camber	°	Standard	0
Caster	°	Standard	0

King pin angle	°	Standard	0
Outer most of minimum turning radius	mm (in.)	Standard	1.0 ton 1645 (65) 1.25 ton 1665 (65.5) 1.5 ton 1770 (67)
King pin outside diameter	mm (in.)	Standard	28.0 (1.10)
King pin outside diameter wear	mm (in.)	Limit value	27.8 (1.094)
Support pin outside diameter	mm (in.)	Standard	50.0 (1.97)
Support pin outside diameter wear	mm (in.)	Limit value	48.5 (1.91)
Bush wear	mm (in.)	Limit value	52.0 (2.05)
Steering knuckle starting force	kg (lb)	Standard	3 – 5 (6.6 – 11)
Rear axle hub starting force	kg (lb)	Standard	1.5 ~ 4.0 (3.3 ~ 8.8)
Axle play on front and rear	mm (in.)	Standard	0.02 ~ 0.04 (0.000787 ~ 0.0157)
Rear axle cylinder			
Cylinder inside diameter	mm (in.)	Standard	60.0 (2.36)
	mm (in.)	Limit value	60.35 (2.38)
Piston rod outside diameter	mm (in.)	Standard	40.0 (1.574)
	mm (in.)	Limit value	39.92 (1.572)
Piston rod bending	mm (in.)	Limit value	1.0 (0.04)
Tightening torque			
Tie-rod castle nut	kg-m (ft-lb)	Standard	7 ~ 8 (50.8 ~ 57.8)
King pin lock nut	kg-m (ft-lb)	Standard	3.0 – 4.5 (22 ~ 32)
Rear axle bracket cap set bolt	kg-m (ft-lb)	Standard	12 ~ 17 (86.6 ~ 122.7)
Rear axle cylinder set bolt	kg-m (ft-lb)	Standard	7.5 ~ 11 (54.2 ~ 79.5)

STEERING

Steering wheel			
Steering wheel play (to idling)	mm (in.)	Standard	20 ~ 40 (0.787 ~ 1.57)
Hydrostatic power steering			
Relief valve set pressure	kg/cm ² (psi)	Standard	55 ~ 65 (782.0 ~ 924.3)
Tightening torque			
Mounting plate set bolt	kg-m (ft-lb)	Standard	2.0 – 2.5 (14.4 – 18.1)
End cap set bolt	kg-m (ft-lb)	Standard	3.0 – 3.5 (21.7 – 25.3)
Relief valve set bolt	kg-m (ft-lb)	Standard	5.0 – 6.0 (36.1 – 43.3)
Relief valve plug (small)	kg-m (ft-lb)	Standard	3.0 – 3.5 (21.7 – 25.3)
Relief valve plug (large)	kg-m (ft-lb)	Standard	5.0 – 6.0 (36.1 – 43.3)
Check valve	kg-m (ft-lb)	Standard	1.0 – 1.4 (7.2 ~ 10.1)
Steering valve set nut	kg-m (ft-lb)	Standard	5.0 ~ 8.0 (36.1 ~ 57.6)

BRAKE

Brake			
Brake lining dimensions (width × thickness × length)	mm (in.)	Standard	48.5 × 5 × 279 (1.91 × 0.2 × 10.98)
Wheel cylinder bore	mm (in.)	Standard	22.22 (0.875)
Master cylinder bore	mm (in.)	Standard	19.05 (0.750)
Master cylinder stroke	mm (in.)	Standard	30.00 (1.181)
Brake pedal play	mm (in.)	Standard	10 ~ 15 (0.4 ~ 0.6)
Brake pedal height (w/pad)	mm (in.)	Standard	160 (6.3)
Inching pedal height (w/pad)	mm (in.)	Standard	160 (6.3)
Inching pedal play	mm (in.)	Standard	3 ~ 8 (0.122 ~ 0.32)
Master cylinder piston wear	mm (in.)	Limit value	0.032 (0.0013)
Wheel cylinder bore & piston clearance	mm (in.)	Standard	0.040 ~ 0.125 (0.0016 ~ 0.0049)
Brake drum inside diameter	mm (in.)	Standard	254.0 (10.00)
	mm (in.)	Limit value	256.0 (10.079)
Brake lining thickness	mm (in.)	Standard	5.0 (0.197)
	mm (in.)	Limit value	1.0 (0.040)
Clearance between drum and lining	mm (in.)	Standard	0.25 ~ 0.5 (0.01 ~ 0.02)
Brake shoe return spring free length	mm (in.)	Standard	102 (4.02)
Adjusting spring free length	mm (in.)	Standard	79 (3.11)
Strut-to-shoe spring free length	mm (in.)	Standard	18 (0.71)
Shoe hold-down spring free length	mm (in.)	Standard	25.7 (1.01)
Tightening torque			
Wheel cylinder ASSY set bolt	kg-m (ft-lb)	Standard	0.8 ~ 1.2 (5.776 ~ 8.664)
Backing plate self lock nut	kg-m (ft-lb)	Standard	5.0 ~ 8.0 (36.1 ~ 57.86)

MAST

Lift bracket roller (V)			
Lift bracket upper/lower part outside diameter	mm (in.)	Standard	94.5 (3.72)
	mm (in.)	Limit value	93.5 (3.68)
Lift bracket upper/lower part inside diameter	mm (in.)	Standard	35.0 (1.37)
	mm (in.)	Limit value	35.02 (1.38)
Lift bracket upper/lower part over size STD outside diameter	mm (in.)	Standard	94.5 (3.72)
Lift bracket upper/lower part over size M outside diameter	mm (in.)	Standard	95.0 (3.74)

Lift bracket upper/lower part over size			
L outside diameter	mm (in.)	Standard	95.9 (3.77)
Lift bracket center part outside diameter	mm (in.)	Standard	93.3 (3.67)
	mm (in.)	Limit value	92.5 (3.64)
Lift bracket center part inside diameter	mm (in.)	Standard	35.0 (1.37)
	mm (in.)	Limit value	35.02 (1.37)
Lift bracket side roller upper part outside diameter	mm (in.)	Standard	65.0 (2.55)
Lift bracket side roller upper part outside diameter	mm (in.)	Limit value	64.0 (2.51)
Lift bracket side roller upper part inside diameter	mm (in.)	Standard	25.0 (0.984)
	mm (in.)	Limit value	25.02 (0.985)
Mast roller (V)			
Inner mast lower part outside diameter	mm (in.)	Standard	114.5 (4.5)
	mm (in.)	Limit value	113.5 (4.46)
Inner mast lower part inside diameter	mm (in.)	Standard	35.0 (1.378)
	mm (in.)	Limit value	35.02 (1.380)
Inner mast lower part over size STD outside diameter	mm (in.)	Standard	114.5 (4.5)
Inner mast lower part over size M outside diameter	mm (in.)	Standard	115.1 (4.53)
Outer mast upper part outside diameter	mm (in.)	Standard	94.5 (3.72)
	mm (in.)	Limit value	93.5 (3.68)
Outer mast upper part inside diameter	mm (in.)	Standard	35.0 (1.378)
	mm (in.)	Limit value	35.02 (1.380)
Lift bracket roller (FV)			
Lift bracket upper/lower part outside diameter	mm (in.)	Standard	94.5 (3.72)
	mm (in.)	Limit value	95.0 (3.74)
Lift bracket upper/lower part inside diameter	mm (in.)	Standard	35.0 (1.378)
	mm (in.)	Limit value	35.02 (1.380)
Lift bracket upper/lower part over size STD outside diameter	mm (in.)	Standard	94.5 (3.72)
	mm (in.)	Limit value	95.0 (3.74)

Lift bracket upper/lower part over size M outside diameter			
mm (in.)	Standard	95.0 (3.74)	
Lift bracket upper/lower part over size L outside diameter			
mm (in.)	Standard	95.6 (3.76)	
Lift bracket center part outside diameter			
mm (in.)	Standard	93.3 (3.67)	
mm (in.)	Limit value	92.5 (3.64)	
Lift bracket center part inside diameter			
mm (in.)	Standard	35.0 (1.378)	
mm (in.)	Limit value	35.02 (1.380)	
Lift bracket side roller upper part outside diameter			
mm (in.)	Standard	62.0 (2.44)	
mm (in.)	Limit value	61.0 (2.4)	
Lift bracket side roller upper part inside diameter			
mm (in.)	Standard	25.0 (0.984)	
mm (in.)	Limit value	25.02 (0.985)	
Mast roller (FV)			
Inner mast lower part outside diameter			
mm (in.)	Standard	114.5 (4.5)	
mm (in.)	Limit value	113.5 (4.46)	
Inner mast lower part inside diameter			
mm (in.)	Standard	35.0 (1.378)	
mm (in.)	Limit value	35.02 (1.380)	
Inner mast lower part over size STD outside diameter			
mm (in.)	Standard	114.5 (4.5)	
Inner mast lower part over size M outside diameter			
mm (in.)	Standard	115.1 (4.53)	
Outer mast upper part outside diameter			
mm (in.)	Standard	94.5 (3.72)	
mm (in.)	Limit value	93.5 (3.68)	
Outer mast upper part inside diameter			
mm (in.)	Standard	35.0 (1.378)	
mm (in.)	Limit value	35.02 (1.380)	
Lift bracket roller (FSV)			
Lift bracket upper/lower part outside diameter			
mm (in.)	Standard	94.5 (3.72)	
mm (in.)	Limit value	93.5 (3.68)	
Lift bracket upper/lower part inside diameter			
mm (in.)	Standard	35.0 (1.378)	
mm (in.)	Limit value	35.02 (1.380)	
Lift bracket upper/lower part over size STD outside diameter			
mm (in.)	Standard	94.5 (3.72)	

Lift bracket upper/lower part over size M outside diameter		mm (in.)	Standard	95.0 (3.74)
Lift bracket side roller upper part outside diameter		mm (in.)	Standard	62.0 (2.44)
		mm (in.)	Limit value	61.0 (2.4)
Lift bracket side roller upper part inside diameter		mm (in.)	Standard	25.0 (0.984)
		mm (in.)	Limit value	25.02 (0.985)
Mast roller (FSV)				
Middle mast lower part outside diameter		mm (in.)	Standard	114.5 (4.5)
		mm (in.)	Limit value	113.5 (4.46)
Middle mast lower part inside diameter		mm (in.)	Standard	35.0 (1.378)
		mm (in.)	Limit value	35.02 (1.380)
Middle mast lower part over size STD outside diameter		mm (in.)	Standard	114.5 (4.5)
Middle mast lower part over size M outside diameter		mm (in.)	Standard	115.1 (4.53)
Inner mast lower part outside diameter		mm (in.)	Standard	94.5 (3.72)
		mm (in.)	Limit value	93.5 (3.68)
Inner mast lower part inside diameter		mm (in.)	Standard	35.0 (1.378)
		mm (in.)	Limit value	35.02 (1.380)
Inner mast lower part over size STD outside diameter		mm (in.)	Standard	94.5 (3.72)
Inner mast lower part over size M outside diameter		mm (in.)	Standard	95.0 (3.74)
Outer mast upper part outside diameter		mm (in.)	Standard	94.5 (3.72)
		mm (in.)	Limit value	93.5 (3.68)
Outer mast upper part inside diameter		mm (in.)	Standard	35.0 (1.378)
		mm (in.)	Limit value	35.02 (1.380)

CYLINDER

Lift cylinder (V)			
Lift cylinder bore	mm (in.)	Standard	45.0 (1.77)
	mm (in.)	Limit value	45.2 (1.78)
Piston rod outside diameter	mm (in.)	Standard	35.0 (1.378)
	mm (in.)	Limit value	34.92 (1.377)
Piston rod bending	mm (in.)	Limit value	2.0 (0.08)
Clearance between piston rod and rod guide sleeve	mm (in.)	Standard	0.1 (0.004)
	mm (in.)	Limit value	0.4 (0.015)
Rear lift cylinder (FSV)			
Lift cylinder bore	mm (in.)	Standard	45.0 (1.77)
	mm (in.)	Limit value	45.2 (1.80)
Piston rod outside diameter	mm (in.)	Standard	35.0 (1.378)
	mm (in.)	Limit value	34.92 (1.377)
Piston rod bending	mm (in.)	Limit value	2.0 (0.08)
Clearance between piston rod and rod guide sleeve	mm (in.)	Standard	0.1 (0.004)
	mm (in.)	Limit value	0.4 (0.015)
Rear lift cylinder (FV)			
Lift cylinder bore	mm (in.)	Standard	50.00 (1.97)
	mm (in.)	Limit value	50.20 (1.98)
Piston rod outside diameter	mm (in.)	Standard	35.00 (1.378)
	mm (in.)	Limit value	34.92 (1.377)
Piston rod bending	mm (in.)	Limit value	2.0 (0.08)
Clearance between piston rod and rod guide sleeve	mm (in.)	Standard	0.1 (0.004)
	mm (in.)	Limit value	0.4 (0.015)
Front lift cylinder (FSV)			
Lift cylinder bore	mm (in.)	Standard	80.00 (3.15)
	mm (in.)	Limit value	80.40 (3.165)
Piston rod outside diameter	mm (in.)	Standard	70.00 (2.76)
	mm (in.)	Limit value	69.91 (2.75)
Piston rod bending	mm (in.)	Limit value	2.0 (0.08)

Clearance between piston rod and rod guide sleeve		mm (in.)	Standard	0.1 (0.004)
		mm (in.)	Limit value	0.4 (0.015)
Front lift cylinder (FV)				
Lift cylinder bore		mm (in.)	Standard	90.00 (3.55)
		mm (in.)	Limit value	90.40 (3.56)
Piston rod outside diameter		mm (in.)	Standard	75.00 (2.95)
		mm (in.)	Limit value	74.91 (2.948)
Piston rod bending		mm (in.)	Limit value	2.0 (0.08)
Clearance between piston rod and rod guide sleeve		mm (in.)	Standard	0.1 (0.004)
		mm (in.)	Limit value	0.4 (0.015)

FLOW REGULATOR VALVE

Flow regulator valve			
Lowering speed (V) no-load	mm/sec (fpm)	Standard	550 (107)
load	mm/sec (fpm)	Standard	500 (98)
Lowering speed (FSV) no-load	mm/sec (fpm)	Standard	440 (86)
load	mm/sec (fpm)	Standard	470 (92)
Lowering speed (FV) no-load	mm/sec (fpm)	Standard	350 (68)
load	mm/sec (fpm)	Standard	400 (78)
Tightening torque			
Flow regulator valve	kg-m (ft-lb)	Standard	6.0 ~ 7.0 (43.3 ~ 50.5)

TILT CYLINDER

Tilt cylinder (V, FSV, FV)			
Tilt cylinder inside diameter	mm (in.)	Standard	70.00 (2.76)
	mm (in.)	Limit value	70.35 (2.77)
Piston rod outside diameter	mm (in.)	Standard	30.00 (1.18)
	mm (in.)	Limit value	29.96 (1.178)
Piston rod bending	mm (in.)	Limit value	1.0 (0.04)
Piston rod to sleeve clearance	mm (in.)	Standard	1.0 (0.04)
	mm (in.)	Limit value	0.4 (0.016)
Tightening torque			
Cylinder cover	kg-m (ft-lb)	Standard	23 — 29 (166 — 209)
Piston castle nut	kg-m (ft-lb)	Standard	23 — 29 (166 — 209)
Rod joint set bolt	kg-m (ft-lb)	Standard	7.5 — 11.4 (54.2— 82.4)

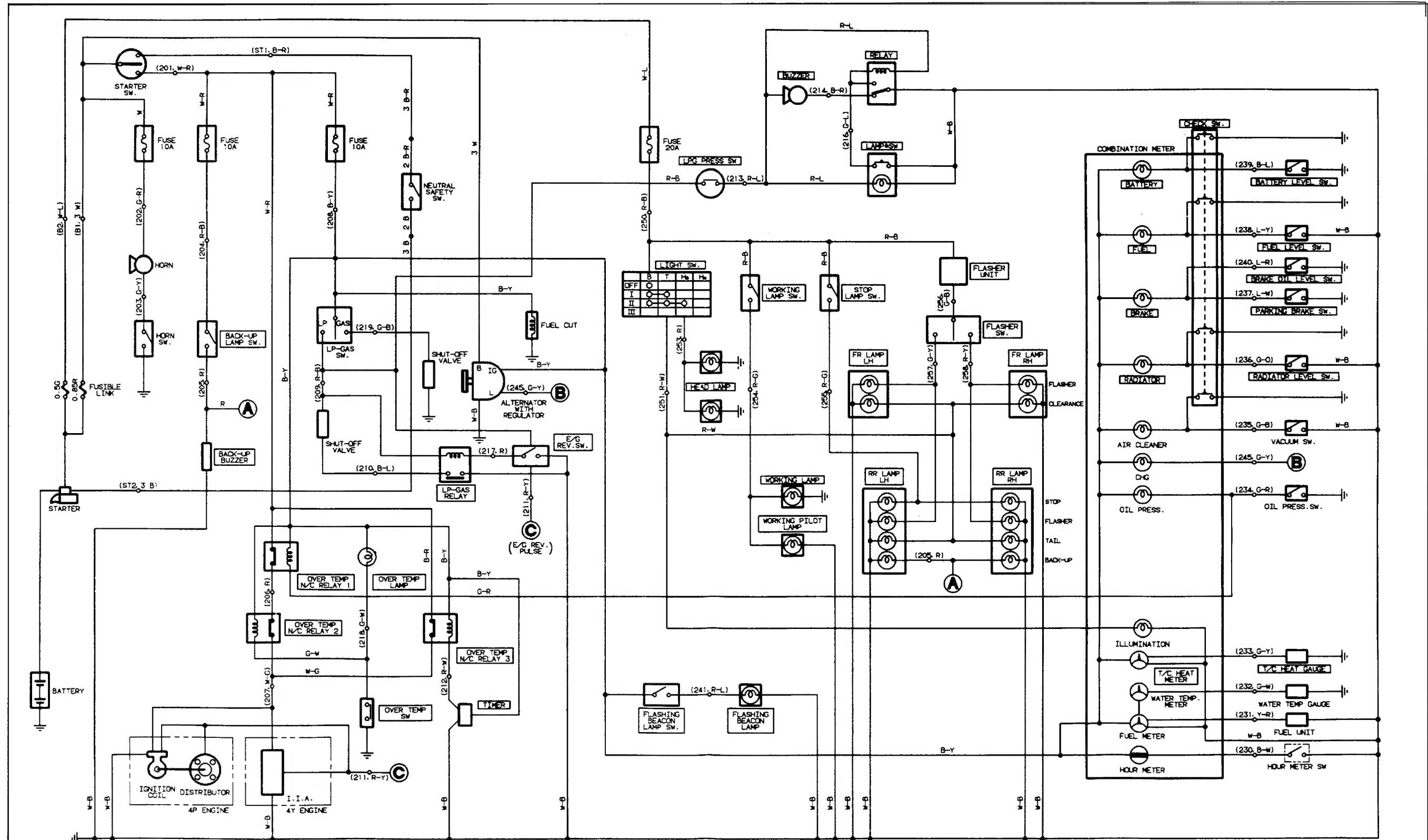
OIL PUMP

Oil pump			
Capacity (at 1500 rpm)			
(4Y)	ℓ /min (US gal/min)	Standard	35.6 (9.4)
(4P)	ℓ /min (US gal/min)	Standard	30.6 (8.1)
Theoretical capacity			
(4Y)	ℓ /min (US gal/min)	Standard	24.5 (6.5)
(4P)	ℓ /min (US gal/min)	Standard	21.0 (5.5)
Depth of internal scratch in body	mm (in.)	Limit value	0.1 (0.004)
Gear shaft diameter	mm (in.)	Limit value	18.935 (9745)
Bush inside diameter	mm (in.)	Limit value	19.123 (0.753)
Length of bush	mm (in.)	Limit value	26.411 (1.040)
Lifting speed (no load) (4Y)	mm/sec (fpm)	Standard	580 (113.4) (For V mast)
(4P)	mm/sec (fpm)	Standard	580 (113.4) (For V mast)
Lifting speed (load) (4Y)	mm/sec (fpm)	Standard	550 (107) (For V mast)
(4P)	mm/sec (fpm)	Standard	540 (106) (For V mast)
Tightening torque			
Oil pump cover set pump	kg-m (ft-lb)	Standard	4.7 ~ 4.96 (33.934 ~ 35.811)

OIL CONTROL VALVE

Oil control valve			
Relief pressure (lift)	kg/cm ² (psi)	Standard	140 (1990)
Relief pressure (tilt)	kg/cm ² (psi)	Standard	120 (1710)

WIRING DIAGRAM



Notes:

1. denotes optional parts.
2. This drawing is for the LPG-gasoline models.